# MINERALS YEARBOOK

## 1956

## Volume III of Three Volumes

# AREA REPORTS

*Prepared by the field staff of the*

**BUREAU OF MINES**

**REGIONAL DIVISIONS OF MINERAL INDUSTRIES**

Digitized by Google

# UNITED STATES DEPARTMENT OF THE INTERIOR

**FRED A. SEATON, *Secretary***

TN
23
.U56
1956
v.3

## BUREAU OF MINES

**MARLING J. ANKENY, *Director***

***OFFICE OF THE DIRECTOR:***

THOMAS H. MILLER, *Deputy Director*
PAUL ZINNER, *Assistant Director for Programs*
JAMES WESTFIELD, *Assistant Director for Health and Safety*
C. W. SEIBEL, *Assistant Director for Helium Activities*
PAUL T. ALLSMAN, *Chief Mining Engineer*
EARL T. HAYES, *Acting Chief Metallurgist*
CARL C. ANDERSON, *Chief Petroleum Engineer*
LOUIS L. NEWMAN, *Acting Chief Coal Technologist*
PAUL W. McGANN, *Chief Economist*
REXFORD C. PARMELEE, *Chief Statistician*
ALLAN SHERMAN, *Chief, Office of Mineral Reports*

***DIVISIONS:***

CHARLES W. MERRILL, *Chief, Division of Minerals*
T. REED SCOLLON, *Chief, Division of Bituminous Coal*
JOSEPH A. CORGAN, *Chief, Division of Anthracite*
R. A. CATTELL, *Chief, Division of Petroleum*
ELMER W. PEHRSON, *Chief, Division of Foreign Activities*
W. E. RICE, *Chief, Division of Administration*

***REGIONAL OFFICES:***

MARK L. WRIGHT, *Acting Regional Director, Region I, Albany, Oreg.*
R. B. MAURER, *Acting Regional Director, Region II, San Francisco, Calif.*
JOHN H. EAST, JR., *Regional Director, Region III, Denver, Colo.*
HAROLD M. SMITH, *Regional Director, Region IV, Bartlesville, Okla.*
EARLE P. SHOUB, *Acting Regional Director, Region V, Pittsburgh, Pa.*

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1958

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington, D. C. – Price $4.25 (Cloth)

Digitized by Google

DEPOSITED BY THE
UNITED STATES OF AMERICA

# FOREWORD

MINERALS YEARBOOK, 1956, published in three volumes provides a record of performance of the Nation's minerals industry during the year, with enough background information to interpret the year's developments.

Volume I includes chapters on metal and nonmetal mineral commodities, with the exception of the mineral fuels. Included also are a chapter reviewing these mineral industries, a statistical summary, and chapters on mining technology, metallurgical technology, and employment and injuries.

Volume II includes chapters on each mineral fuel, an employment and injuries presentation, and a mineral-fuels review chapter that summarizes developments in the fuel industries and incorporates all data previously published in the Statistical Summary chapter. Also now included in this review chapter are data on energy production and uses that have previously been included in the Bituminous Coal chapter.

Volume III is comprised of chapters covering each of the 48 States, plus chapters on the Territory of Alaska, the Territory of Hawaii and island possessions in the Pacific Ocean, and the Commonwealth of Puerto Rico and island possessions in the Caribbean Sea, including the Canal Zone. Volume III also has a Statistical Summary chapter, identical with that in Volume I, and another presenting employment and injury data.

The data in the Minerals Yearbook are based largely upon information supplied by mineral producers, processors, and users, and acknowledgment is made of this indispensable cooperation given by industry. Information obtained from individuals by means of confidential surveys has been grouped to provide statistical aggregates. Data on individual producers are presented only if available from published or other nonconfidential sources, or when permission of the individuals concerned has been granted.

MARLING J. ANKENY, *Director.*



Digitized by Google

Digitized by Google

# ACKNOWLEDGMENTS

In preparing this volume of the MINERALS YEARBOOK, the Bureau of Mines was assisted in collecting statistical data and mineral-industry information by State and Territorial agencies, through cooperative agreements. Many State chapters were reviewed by staff members of these agencies, and in some instances the staff members collaborated in preparing the chapters and are shown as coauthors. For this assistance, acknowledgment is made to the following cooperating State and Territorial organizations:

Alabama: Geological Survey of Alabama.
Alaska: Alaska Department of Mines.
Arkansas: Division of Geology.
California: Division of Mines.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Georgia: Department of Mines, Mining, and Geology.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Department of Conservation.
Iowa: Iowa Geological Survey.
Kansas: State Geological Survey of Kansas.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.
Maine: Department of Development of Industry and Commerce.
Maryland: Department of Geology, Mines, and Water Resources.
Michigan: Michigan Department of Conservation.
Mississippi: Mississippi Geological Survey.
Missouri: Division of Geological Survey and Water Resources.
Montana: Montana Bureau of Mines and Geology.
Nevada: Nevada Bureau of Mines.
New Hampshire: New Hampshire State Planning and Development Commission.
New Jersey: Bureau of Geology and Topography.
New York: State Geological and Natural History Surveys.
North Carolina: Division of Mineral Resources.
North Dakota: North Dakota Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Oregon: State Department of Geology and Mineral Industries.
Pennsylvania: Bureau of Topographic and Geological Survey.
Puerto Rico: Mineralogy and Geology Section, Economic Development Administration, Puerto Rico.
South Carolina: Department of Geology, Mineralogy and Geography.
South Dakota: State Geological Survey.
Tennessee: Tennessee Department of Conservation.
Texas: Bureau of Economic Geology, The University of Texas.
Utah: Utah Geological and Mineralogical Survey.
Virginia: Virginia Geological Survey.
Washington: Department of Conservation and Development.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological Survey.
Wyoming: Geological Survey of Wyoming.

Except for the two review chapters, this volume was prepared by the field staffs of the five Divisions of Mineral Industries. The following supervised preparation of the chapters: Albert J. Kauffman,



Digitized by Google

Jr., chief, Division of Mineral Industries, Region I, Albany, Oreg.; Alvin Kaufman, chief, Field Office, Region I, Juneau, Alaska; R. B. Maurer, chief, Division of Mineral Industries, Region II, San Francisco, Calif.; Alfred L. Ransome, chief, Division of Mineral Industries, Region III, Denver, Colo.; Robert S. Sanford, chief, Division of Mineral Industries, Region IV, Bartlesville, Okla.; Robert D. Thomson, acting chief, Division of Mineral Industries, Region V, Pittsburgh, Pa.; Samuel A. Gustavson, chief, Field Office, Region V, Minneapolis, Minn.; and Avery H. Reed, Jr., chief, Field Office, Region V, Knoxville, Tenn. Preparation of this volume was supervised and the chapters coordinated with those in volumes I and II by Paul Yopes, assistant to the chief, Division of Minerals.

Statisticians and researchers in the Division of Mineral Industries who gave substantial assistance to the authors of the chapters were: In Region I, May G. Downey, Ruth Robotham, and Clara M. Hutcheson; in Region III, Stella K. Drake and Mary Jelliffe; in Region IV, Lovenia M. Edwards, Rosalie M. Miller, Geraldine M. Wright, and Darwina V. Goodchief; in Region V, Dorothy O. Stearns, Roy H. Davis, Eunice M. Garner, Ruth C. Melby, Richard J. Bishop, and Wanda J. Peterson.

The manuscripts upon which this volume is based have been reviewed to insure statistical consistency among the tables, figures, and text, between this volume and volumes I and II and between this volume and those for former years, by a staff under the direct supervision of Kathleen J. D'Amico, assisted by Julia Muscal, Hope R. Anderson, Helen L. Gealy, Ruby J. Phillips, Anita C. Going, Helen E. Tice, Fairy L. McClendon, and Anne C. Rogers.

Minerals Yearbook compilations are based largely on data provided by the mineral industries. Acknowledgment is made of the willing contribution both by companies and individuals of these essential data.

CHARLES W. MERRILL,
*Chief, Division of Minerals.*

Digitized by Google

# CONTENTS


| | Page |
|---|---|
| Foreword, by Marling J. Ankeny | III |
| Acknowledgments, by Charles W. Merrill | V |
| Statistical summary of mineral production, by Kathleen J. D'Amico | 1 |
| Employment and injuries in the mineral industries, by John C. Machisak | 53 |
| The mineral industry of— | |
| Alabama, by Avery H. Reed, Jr., and Walter B. Jones | 59 |
| Alaska, by Alvin Kaufman, Anthony Evans, Phil R. Holdsworth, and May G. Downey | 77 |
| Arizona, by Frank J. Kelly, William H. Kerns, and Breck Parker | 107 |
| Arkansas, by Robert S. Sanford | 145 |
| California, by L. E. Davis, G. C. Branner, and R. Y. Ashizawa | 167 |
| Colorado, by Frank J. Kelly, William H. Kerns, and Breck Parker | 247 |
| Connecticut, by Robert D. Thomson and Mary E. Otte | 303 |
| Delaware, by Robert D. Thomson and Mary E. Otte | 311 |
| Florida, by James L. Vallely and James L. Calver | 315 |
| Georgia, by James L. Vallely and Garland Peyton | 329 |
| Hawaii and Pacific-Island Possessions, by L. E. Davis | 347 |
| Idaho, by Kenneth D. Baber, Frank B. Fulkerson, Norman S. Petersen and Albert J. Kauffman, Jr | 351 |
| Illinois, by Matthew G. Sikich | 391 |
| Indiana, by Donald F. Klyce and John B. Patton | 419 |
| Iowa, by Samuel A. Gustavson | 439 |
| Kansas, by Harvard Eng, Walter H. Schoewe, and Edwin D. Goebel | 457 |
| Kentucky, by Avery H. Reed, Jr., and A. C. McFarland | 493 |
| Louisiana, by Howard E. Rollman and Leo Hough | 511 |
| Maine, by Robert W. Metcalf | 545 |
| Maryland, by James R. Kerr and Jean A. Pendleton | 555 |
| Massachusetts, by Robert W. Metcalf | 567 |
| Michigan, by Donald F. Klyce | 577 |
| Minnesota, by Matthew G. Sikich | 601 |
| Mississippi, by Robert S. Sanford and William C. Morse | 631 |
| Missouri, by W. G. Diamond and G. A. Muilenburg | 643 |
| Montana, by Kenneth D. Baber, Frank B. Fulkerson, Norman S. Petersen, and Albert J. Kauffman, Jr | 669 |
| Nebraska, by D. H. Mullen | 709 |
| Nevada, by L. E. Davis, E. J. Matson, G. C. Branner, and R. Y. Ashizawa | 721 |
| New Hampshire, by Joseph Krickich and Mary E. Otte | 763 |
| New Jersey, by Joseph Krickich and Geraldine C. Slaypoh | 771 |
| New Mexico, by Frank J. Kelly, William H. Kerns, and Breck Parker | 781 |
| New York, by Joseph Krickich and Geraldine C. Slaypoh | 817 |
| North Carolina, by James L. Vallely, Jasper L. Stuckey, and Mildred E. Rivers | 837 |
| North Dakota, by D. H. Mullen | 857 |
| Ohio, by James R. Kerr and Jean A. Pendleton | 869 |
| Oklahoma, by Peter Grandone and William E. Ham | 899 |
| Oregon, by Kenneth D. Baber, Frank B. Fulkerson, Norman S. Petersen, and Albert J. Kauffman, Jr | 925 |
| Pennsylvania, by Robert D. Thomson and Mary E. Otte | 959 |
| Puerto Rico, Panama Canal Zone, and the Virgin Islands, by W. G. Diamond and Mort D. Turner | 1001 |
| Rhode Island, by Joseph Krickich and Geraldine C. Slaypoh | 1007 |
| South Carolina, by James L. Vallely and Laurence L. Smith | 1009 |




Digitized by Google

The mineral industry of—Continued Page
South Dakota, by D. H. Mullen ..... 1019
Tennessee, by Avery H. Reed, Jr., and William D. Hardeman, Jr ..... 1037
Texas, by F. F. Netzeband and John T. Lonsdale ..... 1057
Utah, by Frank J. Kelly, William H. Kerns, and Breck Parker ..... 1121
Vermont, by Robert W. Metcalf ..... 1167
Virginia, by Robert W. Metcalf ..... 1175
Washington, by Kenneth D. Baber, Frank B. Fulkerson, Norman S. Petersen, and Albert J. Kauffman, Jr ..... 1195
West Virginia, by James R. Kerr and Jean Pendleton ..... 1233
Wisconsin, by Lenox H. Rand ..... 1247
Wyoming, by Frank J. Kelly, William H. Kerns, and Breck Parker ..... 1265

Digitized by Google

# Statistical Summary of Mineral Production

By Kathleen J. D'Amico[1]

THIS SUMMARY is identical to the summary given in volume III of this series of mineral production in the United States (including Alaska and Hawaii), its island possessions, the Canal Zone, and the Commonwealth of Puerto Rico and of the principal minerals imported into and exported from the United States. For further details on production see commodity and area chapters. A summary table comparing world and United States mineral production also is included.

Mineral production may be measured at any of several stages of extraction and processing. The stage of measurement used in the chapter is normally what is termed "mine output." It usually refers

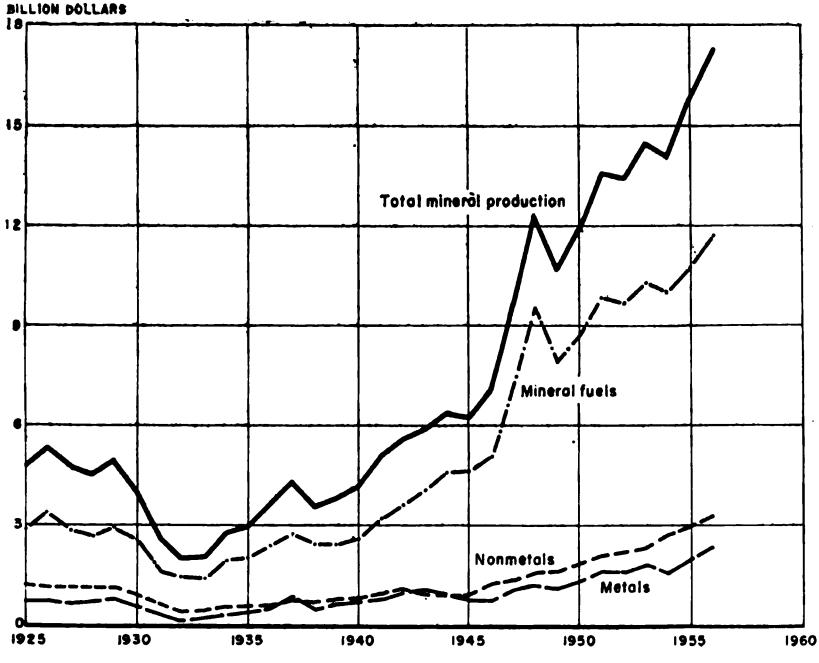



FIGURE 1.—Value of mineral production in the United States, 1925–56.

[1] Publications editor.



Digitized by Google

to minerals in the form in which they are first extracted from the ground but customarily included, for some minerals, the product of auxiliary processing operations at or near mines.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. The quantities of gold, silver, copper, lead, zinc, and tin are recorded on a mine basis—that is, as the recoverable content of ore sold or treated; the values assigned to these quantities, however, are based on the average selling price of refined metal, not the mine value. Mercury is measured in the form of recovered metal and valued at the average New York price for metal.

Data for clays and limestone, 1954–56 include output used in making cement and lime. Mineral-production totals have been adjusted to eliminate duplication of these values.

The weight or volume units shown are those customary in the particular industries producing the respective commodities. No adjustment has been made in the dollar values for changes in the purchasing power of the dollar.

**TABLE 1.—Value of mineral production in continental United States, 1925–56, by mineral groups [1]**

(Million dollars)

| Year | Mineral fuels | Non-metals (except fuels) | Metals | Total | Year | Mineral fuels | Non-metals (except fuels) | Metals | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1925 | 2,910 | 1,187 | 715 | 4,812 | 1941 | 3,228 | 989 | 890 | 5,107 |
| 1926 | 3,371 | 1,219 | 721 | 5,311 | 1942 | 3,568 | 1,056 | 999 | 5,623 |
| 1927 | 2,875 | 1,201 | 622 | 4,698 | 1943 | 4,028 | 916 | 987 | 5,931 |
| 1928 | 2,666 | 1,163 | 655 | 4,484 | 1944 | 4,574 | 836 | 900 | 6,310 |
| 1929 | 2,940 | 1,166 | 802 | 4,908 | 1945 | 4,569 | 888 | 774 | 6,231 |
| 1930 | 2,500 | 973 | 507 | 3,980 | 1946 | 5,090 | 1,243 | 729 | 7,062 |
| 1931 | 1,620 | 671 | 287 | 2,578 | 1947 | 7,188 | 1,338 | 1,084 | 9,610 |
| 1932 | 1,460 | 412 | 128 | 2,000 | 1948 | 9,502 | 1,552 | 1,219 | 12,273 |
| 1933 | 1,413 | 432 | 205 | 2,050 | 1949 | 7,920 | 1,559 | 1,101 | 10,580 |
| 1934 | 1,947 | 520 | 277 | 2,744 | 1950 | 8,689 | 1,822 | 1,351 | 11,862 |
| 1935 | 2,013 | 564 | 365 | 2,942 | 1951 | 9,779 | 2,079 | 1,671 | 13,529 |
| 1936 | 2,405 | 685 | 516 | 3,606 | 1952 | 9,616 | 2,163 | 1,617 | 13,396 |
| 1937 | 2,798 | 711 | 756 | 4,265 | 1953 [2] | 10,257 | 2,350 | 1,811 | 14,418 |
| 1938 | 2,436 | 622 | 460 | 3,518 | 1954 [2] | 9,919 | [3] 2,629 | 1,518 | 14,066 |
| 1939 | 2,423 | 754 | 631 | 3,808 | 1955 [2] | 10,780 | [3] 2,969 | 2,055 | 15,804 |
| 1940 | 2,662 | 784 | 752 | 4,198 | 1956 [2] | 11,708 | [3] 3,276 | 2,362 | 17,346 |

[1] Data for 1925–46 are not strictly comparable with those for subsequent years, since for the earlier years the value of heavy clay products has not been replaced by the value of raw clays used for such products.
[2] Includes Alaska and Hawaii.
[3] The total has been adjusted to eliminate duplicating the value of clays and stone.

Digitized by Google

## TABLE 2.—Mineral production [1] in the United States,[2] 1953–56

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| **MINERAL FUELS** | | | | | | | | |
| Asphalt and related bitumens (native): | | | | | | | | |
| Bituminous limestone and sandstone | 1,440,544 | 4,349 | 1,337,822 | 3,686 | 1,427,207 | 4,111 | 1,458,533 | 4,114 |
| Gilsonite | 60,505 | 2,184 | 75,943 | 2,724 | 82,822 | 3,117 | 89,003 | 3,822 |
| Carbon dioxide, natural (estimated) thousand cubic feet | 670,600 | 203 | 638,900 | 211 | 702,417 | 234 | 713,030 | 235 |
| Coal: | | | | | | | | |
| Bituminous [3] thousand short tons | 454,439 | 2,241,150 | 387,463 | 1,759,290 | 464,633 | 2,092,383 | 500,874 | 2,412,004 |
| Lignite do | 2,851 | 6,794 | 4,243 | 10,330 | | | | |
| Pennsylvania anthracite do | 30,949 | 299,140 | 29,083 | 247,870 | 26,205 | 206,097 | 28,900 | 236,785 |
| Helium thousand cubic feet | 157,652 | 2,103 | 189,873 | 3,202 | 235,868 | 3,881 | 266,937 | 4,413 |
| Natural gas million cubic feet | 8,396,916 | 774,966 | 8,742,546 | 882,501 | 9,405,351 | 978,357 | 10,081,923 | 1,083,812 |
| Natural-gas liquids: | | | | | | | | |
| Natural gasoline and cycle products thousand gallons | 5,327,448 | 406,242 | 5,385,282 | 402,418 | 5,844,904 | 423,775 | 5,807,100 | 431,958 |
| LP-gases do | 4,692,870 | 191,598 | 5,204,304 | 178,994 | 5,972,698 | 195,231 | 6,487,413 | 265,185 |
| Peat | 204,209 | 1,618 | 244,163 | 2,258 | 273,669 | 2,283 | 292,097 | 2,460 |
| Petroleum (crude) thousand 42-gallon barrels | 2,357,082 | 6,327,100 | 2,314,988 | 6,424,930 | 2,484,428 | 6,870,380 | 2,617,283 | 7,262,925 |
| Total mineral fuels | | 10,257,000 | | 9,919,000 | | 10,780,000 | | 11,708,000 |
| **NONMETALS (EXCEPT FUELS)** | | | | | | | | |
| Abrasive stone: [4] | | | | | | | | |
| Grindstones and pulpstones | 2,499 | 170 | 2,218 | 164 | 2,799 | 196 | (5) | (5) |
| Millstones | (5) | 18 | (5) | (5) | (5) | (5) | (5) | 4 |
| Pebbles (grinding) | 2,472 | 81 | 3,070 | 99 | 2,130 | 68 | 2,330 | 71 |
| Tube-mill liners (natural) | 1,219 | 69 | 933 | 59 | (5) | (5) | 1,061 | 74 |
| Asbestos | 54,456 | 4,857 | 47,621 | 4,698 | 44,568 | 4,487 | 41,312 | 4,742 |
| Barite | 944,212 | 9,436 | 883,283 | 8,508 | 1,108,103 | 10,809 | 1,299,888 | 13,498 |
| Boron minerals | 715,228 | 17,668 | 790,449 | 26,714 | 924,496 | 33,816 | 944,950 | 39,592 |
| Bromine thousand pounds | 164,143 | 35,372 | 187,399 | 41,313 | 184,454 | 39,856 | 196,730 | 47,434 |
| Cement thousand 376-pound barrels | 260,697 | 698,268 | 274,703 | 763,413 | 306,128 | 884,381 | 321,295 | 989,233 |
| Clays thousand short tons | 42,299 | 125,025 | 42,497 | 123,165 | 48,106 | 139,540 | [7] 50,149 | [7] 157,329 |
| Emery | 10,562 | 144 | 9,758 | 132 | 10,735 | 151 | 12,153 | 174 |
| Epsom salts from epsomite | 200 | 8 | (5) | (5) | 100 | 5 | (5) | (5) |
| Feldspar long tons | 452,600 | 4,594 | 411,018 | 3,490 | 465,378 | 3,801 | 622,429 | 5,764 |
| Fluorspar | 318,036 | 15,737 | 245,628 | 12,333 | 279,540 | 12,590 | 329,719 | 14,257 |
| Garnet (abrasive) | 10,520 | 989 | 14,183 | 971 | 11,835 | 1,191 | 9,812 | 1,073 |
| Gem stones (estimated) | (6) | 502 | (6) | 613 | (6) | 818 | (6) | 925 |
| Graphite | 6,281 | (5) | (5) | (5) | (5) | (5) | (5) | (5) |
| Gypsum | 8,292,876 | 23,175 | 8,995,960 | 27,384 | 10,683,733 | 33,938 | 10,316,483 | 34,099 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 2.—Mineral production [1] in the United States,[2] 1953–56—Continued**

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| NONMETALS (EXCEPT FUELS)—continued | | | | | | | | |
| Iron oxide pigment materials (crude) | | | 16,259 | 129 | 16,190 | 157 | 15,362 | 156 |
| Lime | 9,666,845 | 112,001 | 8,620,735 | 101,525 | 10,469,536 | 126,890 | 10,567,252 | 135,532 |
| Magnesite | 553,147 | 3,224 | 284,015 | 1,391 | 486,088 | 2,713 | 686,569 | 2,502 |
| Magnesium compounds from sea water and brines (except for metals)—$M_gO$ equivalent | 136,824 | 10,460 | 113,774 | 9,469 | 155,779 | 12,704 | 169,019 | 13,668 |
| Marl: | | | | | | | | |
| Calcareous (except for cement) | 277,354 | 173 | 206,257 | 152 | 183,044 | 128 | 285,653 | 215 |
| Greensand | 6,821 | 193 | 2,838 | 199 | 5,704 | 218 | (3) | (3) |
| Mica: | | | | | | | | |
| Scrap | 73,259 | 1,824 | 81,073 | 1,734 | 95,432 | 2,058 | 86,309 | 1,850 |
| Sheet—pounds | 1,068,706 | 2,154 | 668,788 | 2,393 | 642,113 | 3,370 | 887,871 | 2,747 |
| Perlite | 198,751 | 1,440 | 219,703 | 1,762 | 286,157 | 2,282 | 310,800 | 2,550 |
| Phosphate rock—thousand long tons | 12,504 | 76,632 | 13,821 | 86,669 | 12,265 | 75,379 | 15,747 | 97,922 |
| Potassium salts—$K_2O$ equivalent | 1,731,607 | 65,403 | 1,918,157 | 71,819 | [8] 2,005,863 | [8] 76,176 | 2,103,347 | 79,751 |
| Pumice | 1,338,206 | 2,510 | 1,647,397 | 2,974 | 1,804,488 | 3,369 | 1,482,214 | 4,750 |
| Pyrites—long tons | 922,647 | 5,006 | 908,715 | 7,159 | [9] 1,006,943 | [9] 8,391 | 1,069,904 | 9,743 |
| Quartz from pegmatites and quartzite | 245,755 | 1,384 | (10) | (10) | (10) | (10) | (10) | (10) |
| Salt (common)—thousand short tons | 21,013 | 78,146 | 20,926 | 105,487 | 22,693 | 123,257 | 24,206 | 136,139 |
| Sand and gravel—do | 440,086 | 374,451 | 556,160 | 503,293 | [9] 591,683 | [9] 535,510 | 624,697 | 595,101 |
| Sand and sandstone (ground) | 784,792 | 6,874 | (11) | (11) | (11) | (11) | (11) | (11) |
| Slate | 698,589 | 12,638 | 760,921 | 12,961 | 760,440 | 12,914 | 645,479 | 11,666 |
| Sodium carbonate (natural) | 419,206 | 10,627 | 527,282 | 13,536 | 613,594 | 15,001 | 652,891 | 17,400 |
| Sodium sulfate (natural) | 248,230 | 3,341 | 249,701 | 3,890 | 284,549 | 5,381 | 329,607 | 6,328 |
| Stone [12]—thousand short tons | 303,814 | 476,168 | 409,196 | 609,445 | 467,272 | [9] 702,142 | 503,396 | 761,876 |
| Strontium minerals (crude) | 50 | 1 | 12 | (13) | 177 | 4 | 4,040 | 77 |
| Sulfur: | | | | | | | | |
| Frasch-process mines—long tons | 5,224,202 | 141,054 | 5,328,040 | 142,014 | 5,839,300 | 163,156 | 5,675,913 | 150,356 |
| Other mines—do | 152,473 | 769 | 185,085 | (3) | 199,899 | (3) | 185,532 | (3) |
| Sulfur, recovered elemental—do | 315,019 | 8,059 | 399,950 | 11,209 | 458,021 | 12,585 | 503,314 | 14,241 |
| Talc, pyrophyllite and soapstone | 631,538 | 3,524 | 618,994 | 3,493 | 725,708 | [9] 4,517 | 739,039 | 4,859 |
| Titanium-iron concentrate (non-titanium use) | 1,585 | 8 | (3) | (3) | 1,350 | 7 | | |
| Tripoli | 36,183 | 1,139 | 41,625 | 1,459 | 47,362 | 213 | 45,009 | 203 |
| Vermiculite | 189,535 | 2,445 | 195,538 | 2,538 | 204,040 | 2,702 | 192,628 | 2,543 |
| Value of items that cannot be disclosed: Aplite, brucite, calcium-magnesium chloride, certain clays, diatomite, iodine, kyanite, lithium minerals, olivine, sharpening stones, wollastonite, and values indicated by footnote 5. Excludes value of clays used for cement (1953) | | 12,475 | | 22,580 | | 30,805 | | 40,778 |
| Total nonmetallic minerals | | 2,350,000 | | [14] 2,629,000 | | [14] 2,969,000 | | [14] 3,276,000 |

Digitized by Google

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **METALS** | | | | | | | | | |
| Antimony ore and concentrate | antimony content | 2,161 | [18] | 766 | [18] | 633 | [18] | 590 | [18] |
| Bauxite | long tons, dried equivalent | 1,579,739 | 13,439 | 1,994,896 | 16,403 | 1,788,341 | 14,543 | 1,743,344 | 13,973 |
| Beryllium concentrate | gross weight | 751 | 355 | 669 | 304 | 500 | 268 | 460 | 237 |
| Chromite | do | 58,817 | 3,433 | 163 | 7,164 | 153,253 | 6,644 | [16] 207,662 | [16] 8,715 |
| Cobalt (content of concentrate) | pounds | 1,775,489 | [18] | 2,219,396 | [18] | 2,438,546 | [18] | 3,657,491 | 3,462 |
| Columbium-tantalum concentrate | do | 14,867 | 30 | 32,829 | 57 | 12,954 | 22 | 216,606 | [11] |
| Copper (recoverable content of ores, etc.) | | 926,448 | 531,781 | 835,472 | 492,929 | 998,570 | 744,933 | 1,106,215 | 940,283 |
| Gold (recoverable content of ores, etc.) | troy ounces | 1,958,293 | 68,540 | 1,837,310 | 64,306 | 1,880,142 | 65,805 | 1,831,765 | 64,112 |
| Iron ore, usable (excluding byproduct iron sinter) | thousand long tons, gross weight | 117,198 | 790,491 | 76,126 | 525,818 | 105,237 | 748,602 | [8] 96,730 | [8] 747,665 |
| Lead (recoverable content of ores, etc.) | | 342,644 | 89,773 | 325,419 | 89,165 | 338,025 | 100,731 | 352,826 | 110,787 |
| Manganese ore (35 percent or more Mn) | gross weight | 157,536 | 12,480 | 206,128 | 15,176 | 287,254 | 21,651 | 344,735 | 26,990 |
| Manganiferous ore (5 to 35 percent Mn) | do | 1,239,390 | 6,947 | 558,332 | 3,079 | 911,636 | 5,128 | 680,651 | 3,984 |
| Manganiferous residuum | do | 293,758 | [18] | 214,931 | [18] | 213,370 | [18] | 130,129 | [18] |
| Mercury | 76-pound flasks | 14,337 | 2,767 | 18,543 | 4,903 | 18,955 | 5,504 | 24,177 | 6,284 |
| Molybdenum (content of concentrate) | thousand pounds | 53,823 | 52,362 | 64,021 | 64,070 | 64,709 | 66,919 | 57,126 | 72,012 |
| Nickel (content of ore and concentrate) | | 11 | [18] | 14 | [18] | 4,411 | [18] | 7,392 | [18] |
| Silver (recoverable content of ores, etc.) | troy ounces | 37,570,838 | 34,004 | 36,941,383 | 33,434 | 37,197,742 | 33,666 | 38,948,121 | 35,250 |
| Titanium concentrate: | | | | | | | | | |
| Ilmenite | gross weight | 512,176 | 7,223 | 531,895 | 7,375 | 573,192 | 10,268 | 735,388 | 14,199 |
| Rutile | do | 6,476 | 703 | 7,305 | 870 | 9,182 | 1,122 | 12,065 | 1,749 |
| Tungsten ore and concentrate | 60-percent $WO_3$ basis | 9,590 | 35,944 | 13,691 | 51,433 | 16,412 | 60,841 | 14,737 | 51,201 |
| Uranium ore | | [17] | [17] | [17] | [17] | [17] | [17] | 3,000,000 | 67,570 |
| Vanadium | pounds | 6,114,851 | [18] | 6,051,784 | [18] | 6,571,655 | [18] | 7,735,088 | [18] |
| Zinc (recoverable content of ores, etc.) | | 547,430 | 125,321 | 473,471 | 102,180 | 514,671 | 126,609 | 542,340 | 148,503 |
| Zirconium concentrate | | 21,234 | 794 | 17,959 | 820 | 28,913 | 1,426 | [18] | [18] |
| Value of items that cannot be disclosed: Magnesium chloride for magnesium metal, platinum-group metals (crude), rare-earth metals concentrates, tin (1953–55), and values indicated by footnote 15 | | | 34,378 | | 38,880 | | 40,596 | | 45,242 |
| Total metals | | | 1,811,000 | | 1,518,000 | | 2,055,000 | | 2,362,000 |
| Grand total mineral production | | | 14,418,000 | | 14,066,000 | | 15,804,000 | | 17,346,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Includes Alaska and Hawaii.
[3] Includes small quantity of anthracite mined in States other than Pennsylvania.
[4] Excludes sharpening stones, value for which is included with "Nonmetallic items that cannot be disclosed."
[5] Figure withheld to avoid disclosing individual company confidential data; value included with "Nonmetal items that cannot be disclosed."
[6] Weight not recorded.
[7] Excludes certain clays, value included with "Nonmetal items that cannot be disclosed."
[8] Final figure. Supersedes preliminary figure given in commodity chapter.
[9] Revised figure.
[10] Beginning with 1954, quartz from pegmatites and quartzite included with stone.
[11] Beginning with 1954, sand and sandstone (ground) included with sand and gravel or stone.
[12] Excludes abrasive stone, bituminous limestone, bituminous sandstone, and ground soapstone, all included elsewhere in table. Also excludes limestone for cement and lime in 1953.
[13] Less than $1,000.
[14] The total has been adjusted to eliminate duplication in the value of clays and stone.
[15] Figure withheld to avoid disclosing individual company confidential data, value included with "Metal items that cannot be disclosed."
[16] Includes 45,710 short tons of concentrate produced in 1955 and 1956 from low-grade ore and concentrate stockpiled near Coquille, Oreg. during World War II.
[17] Data not available.

Digitized by Google

TABLE 2. -Minerals produced in the United States,[1] by States, and principal producing States in 1956

| State | [illegible] | Asphalt | Asbestos | Asphalt | Barite | Bauxite | Beryllium | Boron | Bromine | Bruchite | Calcium magnesium chloride | Carbon dioxide | Cement | Chromite | Clays | Coal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | | | | 2 | | 2 | | | | | | | 2 | | √ | √ |
| Alaska | | | | | | | | | | | | | | 4 | | √ |
| Arizona | | | 2 | | | | | | | | | | | | √ | √ |
| Arkansas | | | | | 1 | 1 | √ | | | | | | √ | | √ | √ |
| California | | | 3 | | √ | | 2 | 1 | 3 | | 2 | √ | 2 | 3 | √ | √ |
| Colorado | | | | | | | √ | | | | | | √ | | √ | √ |
| Connecticut | | | | | | | | | | | | | | | √ | |
| Delaware | | | | | | | | | | | | | | | √ | |
| Florida | | | | | | | | | | | | | √ | | √ | |
| Georgia | | | | | 4 | 3 | √ | | | | | | √ | | √ | √ |
| Hawaii | | | | | | | | | | | | | | | √ | |
| Idaho | 1 | | | | √ | | | | | | | | √ | | √ | |
| Illinois | | | | | | | | | | | | | √ | | √ | 4 |
| Indiana | | | | | | | | | | | | | 3 | | √ | √ |
| Iowa | | | | | | | | | | | | | √ | | √ | √ |
| Kansas | | | | | | | | | | | | | √ | | √ | √ |
| Kentucky | | | | √ | | | | | | | | | √ | | √ | 3 |
| Louisiana | | | | | | | | | | | | | √ | | √ | |
| Maine | | | | | | | √ | | | | | | √ | | √ | |
| Maryland | | | | | | | | | | | | | √ | | √ | √ |
| Massachusetts | | | | | | | | | | | | | | | √ | |
| Michigan | | | | | | | | | 2 | | 1 | | 4 | | √ | |
| Minnesota | | | | | | | | | | | | | √ | | √ | |
| Mississippi | | | | | | | | | | | | | √ | | √ | |
| Missouri | | | | √ | 2 | | | | | | | | √ | | √ | √ |
| Montana | | | | | √ | | | | | | | | √ | 1 | √ | √ |
| Nebraska | | | | | | | | | | | | | √ | | √ | |
| Nevada | 2 | | | | 3 | | | | | 1 | | | | | √ | |
| New Hampshire | | | | | | | 4 | | | | | | | | √ | |
| New Jersey | | | | | | | | | | | | | | | √ | |
| New Mexico | | | | | √ | | 3 | | | | | 1 | | | √ | √ |
| New York | | | | | | | | | | | | | √ | | √ | |
| North Carolina | | | | | | | √ | | | | | | | | √ | |
| North Dakota | | | | | | | | | | | | | | | √ | √ |
| Ohio | | | | | | | | | | | 4 | | √ | | 1 | √ |
| Oklahoma | | | | 4 | | | | | | | | | √ | | √ | √ |
| Oregon | | | | | | | | | | | | √ | | 2 | √ | |
| Pennsylvania | | | | | | | | | | | | | 1 | | 2 | 2 |
| Rhode Island | | | | | | | | | | | | | | | | |
| South Carolina | | | | | √ | | | | | | | | | | √ | |
| South Dakota | | | | | | | 1 | | | | | | √ | | √ | √ |
| Tennessee | | | | | √ | | | | | | | | √ | | √ | √ |
| Texas | | | | 1 | | | | | 1 | | | | √ | | 3 | |
| Utah | | | | 3 | | | | | | | | 3 | √ | | √ | √ |
| Vermont | | | 1 | | | | | | | | | | | | √ | |
| Virginia | | 1 | | | | | √ | | | | | | √ | | √ | √ |
| Washington | | | | | | | | | | | | 4 | √ | √ | √ | √ |
| West Virginia | | | | | | | | | 4 | | 3 | | √ | | √ | 1 |
| Wisconsin | | | | | | | | | | | | | | | √ | |
| Wyoming | | | | | | | √ | | | | | | | | √ | √ |

[1] Includes Alaska and Hawaii.

Digitized by Google

TABLE 3.—Minerals produced in the United States,[1] by States, and principal producing States in 1956—Continued

| State | Cobalt | Columbium-tantalum | Copper | Diatomite | Emery | Epsomite | Feldspar | Fluorspar | Garnet | Gem stones | Gold | Graphite | Gypsum | Helium | Iodine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | | | | | | | | | | | | | | | |
| Alaska | | | | | | | | | | 3 | 3 | | √ | | |
| Arizona | | | 1 | | | | √ | | | | | | | | |
| Arkansas | | | | | | | | | | √ | | | √ | | |
| California | | | √ | 1 | | | 2 | | | √ | 4 | | 2 | | 1 |
| Colorado | | √ | √ | | | | 3 | 3 | | √ | √ | | √ | | |
| Connecticut | | | | | | | √ | | | | | | | | |
| Delaware | | | | | | | | | | | | | | | |
| Florida | | | | | | | | | 3 | | | | | | |
| Georgia | | | | | | | √ | | | √ | | | | | |
| Hawaii | | | | | | | | | | | | | | | |
| Idaho | 1 | 1 | √ | | | | | | 2 | √ | √ | | | | |
| Illinois | | | | | | | | 1 | | | | | | | |
| Indiana | | | | | | | | | | | | | √ | | |
| Iowa | | | | | | | | | | | | | 3 | | |
| Kansas | | | | | | | | | | | | | √ | 3 | |
| Kentucky | | | | | | | | √ | | | | | | | |
| Louisiana | | | | | | | | | | | | | √ | | |
| Maine | | 2 | | | | | √ | | | √ | | | | | |
| Maryland | | | | | | | | | | | | | | | |
| Massachusetts | | | | | | | | | | | | | | | |
| Michigan | | | √ | | | | | | | √ | | | 1 | | |
| Minnesota | | | | | | | | | | √ | | | | | |
| Mississippi | | | | | | | | | | | | | | | |
| Missouri | 2 | | √ | | | | | | | | | | | | |
| Montana | | | 3 | | | | | 2 | | √ | √ | | √ | | |
| Nebraska | | | | | | | | | | √ | | | | | |
| Nevada | | | 4 | 2 | | | | 4 | | √ | √ | | √ | | |
| New Hampshire | | | | | | | √ | | | √ | | | | | |
| New Jersey | | | | | | | | | | √ | | | | | |
| New Mexico | | 4 | √ | | | | | | | √ | √ | | | 2 | |
| New York | | | | | 1 | | | | 1 | √ | | | √ | | |
| North Carolina | | | √ | | | | 1 | | | √ | √ | | | | |
| North Dakota | | | | | | | | | | | | | | | |
| Ohio | | | | | | | | | | | | | √ | | |
| Oklahoma | | | | | | | | | | | | | √ | | |
| Oregon | | | √ | 3 | | | | | | 1 | √ | | | | |
| Pennsylvania | 3 | | √ | | | | | | | √ | √ | | | | |
| Rhode Island | | | | | | | | | | | | 2 | | | |
| South Carolina | | | | | | | | | | | | | | | |
| South Dakota | | 3 | | | | | 4 | | | √ | 1 | | √ | | |
| Tennessee | | | √ | | | | | √ | | | √ | | | | |
| Texas | | | | | | | √ | | | 2 | | 1 | 4 | 1 | |
| Utah | | | 2 | | | | | √ | | √ | 2 | | √ | | |
| Vermont | | | √ | | | | | | | √ | √ | | | | |
| Virginia | | | | | | | √ | | | √ | | | √ | | |
| Washington | | | √ | 4 | | 1 | | | | 4 | √ | | √ | | |
| West Virginia | | | | | | | | | | | | | | | |
| Wisconsin | | | | | | | | | | √ | | | | | |
| Wyoming | | | √ | | | | √ | | | √ | √ | | √ | | |

[1] Includes Alaska and Hawaii.

Digitized by Google

TABLE 3.—Minerals produced in the United States,[1] by States, and principal producing States in 1956—Continued

| State | Iron ore | Iron oxide pigments | Kyanite | Lead | Lime | Magnesite | Magnesium chloride | Magnesium compounds | Manganese | Mercury | Mica | Molybdenum | Natural gas | Natural-gas liquids | Nickel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 3 | | | | √ | | | | | | 4 | | √ | | |
| Alaska | | | | √ | √ | | | | | √ | | | | | |
| Arizona | | | | √ | √ | | | | 3 | √ | | 3 | √ | | |
| Arkansas | √ | | | | √ | | | | 4 | | | | √ | √ | |
| California | √ | | | √ | √ | 3 | | 1 | √ | 1 | √ | √ | √ | 2 | |
| Colorado | √ | | | 4 | | | | | | | √ | 1 | √ | √ | |
| Connecticut | | | | | √ | | | | | | | | | | |
| Delaware | | | | | | | | | | | | | | | |
| Florida | | | | | √ | | | | | | | | √ | | |
| Georgia | √ | 2 | | | | | | | √ | | 3 | | | | |
| Hawaii | | | | | √ | | | | | | | | | | |
| Idaho | | | | 2 | | | | | | 3 | | | | | |
| Illinois | | | | √ | 4 | | | | | | | | √ | √ | 3 |
| Indiana | | | | | √ | | | | | | | | √ | | |
| Iowa | | | | | √ | | | | | | | | | | |
| Kansas | | | | √ | | | | | | | | | √ | √ | |
| Kentucky | √ | | | √ | | | | | | | | | √ | √ | |
| Louisiana | | | | | √ | | | | | | | | 2 | 3 | |
| Maine | | | | | √ | | | | | | √ | | | | |
| Maryland | | | | | √ | | | | | | | | √ | | |
| Massachusetts | | | | | √ | | | | | | | | | | |
| Michigan | 2 | 1 | | | √ | | | 2 | | | | | √ | √ | |
| Minnesota | 1 | √ | | | √ | | | | √ | | | | | | |
| Mississippi | √ | | | | | | | | | | | | √ | √ | |
| Missouri | √ | √ | | 1 | 2 | | | | | | | | √ | | 2 |
| Montana | √ | | | √ | √ | | | | 2 | | | | √ | √ | |
| Nebraska | | | | | | | | | | | | | √ | √ | |
| Nevada | √ | | | √ | √ | 2 | | | 1 | 2 | | √ | | | |
| New Hampshire | | | | | | | | | | | √ | | | | |
| New Jersey | √ | | | | √ | | | 3 | | | | | | | |
| New Mexico | √ | | | √ | √ | | | √ | √ | | √ | 4 | 4 | √ | |
| New York | √ | 4 | | √ | √ | | | | | | | | √ | | |
| North Carolina | | | | √ | | | | | | | 1 | | | | |
| North Dakota | | | | | | | | | | | | | √ | √ | |
| Ohio | | | | | 1 | | | | | | | | √ | √ | |
| Oklahoma | | | | √ | √ | | | | | | | | 3 | 4 | |
| Oregon | √ | 3 | | √ | | | | | | 4 | | | | | 1 |
| Pennsylvania | √ | √ | | | 3 | | | | | | √ | | | | |
| Rhode Island | | | | | | | | | | | | | | | |
| South Carolina | | | 2 | | | | | | | | 2 | | | | |
| South Dakota | √ | | | | √ | | | | | | √ | | | | |
| Tennessee | √ | | | √ | √ | | | | √ | | √ | | √ | | |
| Texas | √ | | | | √ | | 1 | 4 | | √ | | | 1 | 1 | |
| Utah | 4 | | | 3 | √ | | | | | | | 2 | √ | √ | |
| Vermont | | | | | √ | | | | | | | | | | |
| Virginia | | √ | 1 | √ | √ | | | | √ | | | | √ | | |
| Washington | √ | | | √ | √ | 1 | | | | | | | | | |
| West Virginia | | | | | √ | | | | | | | | √ | √ | |
| Wisconsin | √ | | | √ | √ | | | | | | | | | | |
| Wyoming | √ | | | | | | | | | | | | √ | √ | |

[1] Includes Alaska and Hawaii.

Digitized by Google

TABLE 3.—Minerals produced in the United States,[1] by States, and principal producing States in 1956—Continued

| State | Olivine | Peat | Perlite | Petroleum | Phosphate rock | Platinum-group metals | Potassium salts | Pumice | Pyrites | Rare-earth metals | Salt | Sand and gravel | Silver | Slate | Sodium carbonate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | | | | √ | | | | | | | √ | √ | | | |
| Alaska | | | | | | 1 | | | | | | √ | √ | | |
| Arizona | | | 4 | | | | | 3 | | √ | | √ | 4 | | |
| Arkansas | | | | √ | | | | | | | | √ | | √ | |
| California | | √ | √ | 2 | | 2 | 2 | 1 | 3 | 4 | √ | 1 | √ | √ | 2 |
| Colorado | | 2 | 2 | √ | | | | √ | 4 | √ | √ | √ | √ | | |
| Connecticut | | | | | | | | | | | | √ | | | |
| Delaware | | √ | | | | | | | | | | √ | | | |
| Florida | | 1 | | √ | 1 | | | | | 2 | | √ | | | |
| Georgia | | √ | | | | | | | | | | √ | | 1 | |
| Hawaii | | | | | | | | √ | | | √ | √ | | | |
| Idaho | | | | | 3 | | | 4 | | 3 | | √ | 1 | | |
| Illinois | | √ | | √ | | | | | | | | 3 | √ | | |
| Indiana | | √ | | √ | | | | | | | | √ | | | |
| Iowa | | 4 | | | | | | | | | | √ | | | |
| Kansas | | | | √ | | | | √ | | | √ | √ | | | |
| Kentucky | | | | √ | | | | | | | | √ | √ | | |
| Louisiana | | | | 3 | | | | | | | 4 | √ | | | |
| Maine | | √ | | | | | | | | | | √ | | √ | |
| Maryland | | | | | | | √ | | | | | √ | | | |
| Massachusetts | | √ | | | | | | | | | | √ | | | |
| Michigan | | 3 | | √ | | | 4 | | | | 1 | 2 | √ | | |
| Minnesota | | √ | | | | | | | | | | √ | | | |
| Mississippi | | | | √ | | | | | | | | √ | | | |
| Missouri | | — | | √ | | | | √ | √ | | | √ | √ | | |
| Montana | | | | √ | 4 | | | √ | | | | √ | 2 | | |
| Nebraska | | | | √ | | | | √ | | | | √ | | | |
| Nevada | | | 3 | √ | | | | | | | √ | √ | √ | | |
| New Hampshire | | | | | | | | | | | | √ | | | |
| New Jersey | | √ | | | | | | | | | | √ | | | |
| New Mexico | | √ | 1 | √ | | | 1 | 2 | | √ | √ | √ | √ | | |
| New York | | | | √ | | | | | | | 3 | √ | √ | 4 | |
| North Carolina | | √ | | | | | | | | | | √ | | | |
| North Dakota | | | | | | | | | | | | 4 | | | |
| Ohio | | √ | | √ | | | | √ | | | √ | √ | √ | | |
| Oklahoma | | | | 4 | | | | √ | | | √ | √ | | | |
| Oregon | | | | | | | | √ | | | | √ | √ | | 3 |
| Pennsylvania | | | | | | | | √ | √ | | | √ | √ | 3 | |
| Rhode Island | | | | | | | | | | | | √ | | | |
| South Carolina | | | | | | | | | | 1 | | √ | | | |
| South Dakota | | | | | | | | | | | | √ | √ | | |
| Tennessee | | | | √ | 2 | | | | 1 | | | √ | | | |
| Texas | | | | 1 | | | | √ | | | 2 | √ | | | |
| Utah | | | √ | √ | √ | | 3 | √ | | | √ | √ | 3 | | |
| Vermont | | | | | | | | | √ | | | √ | √ | 2 | |
| Virginia | | | | √ | | | | | 2 | | √ | √ | √ | √ | |
| Washington | 2 | 2 | | | | | | √ | | | | √ | | | |
| West Virginia | | | | √ | | | | | | | √ | √ | | | |
| Wisconsin | | | | | | | | | | | | √ | | | |
| Wyoming | | | | √ | √ | | | √ | | | | √ | √ | | 1 |

[1] Includes Alaska and Hawaii.

465877—58——2

Digitized by Google

TABLE 4.—Minerals produced in the United States,[1] by States, and principal producing States in 1956—Continued

| State | Sodium sulfate | Stone | Strontium | Sulfur | Talc, pyrophyllite, and soapstone | Tin | Titanium | Tripoli | Tungsten | Uranium | Vanadium | Vermiculite | Volcanic ash | Zinc | Zirconium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | | √ | | | √ | | | | | | | | | | |
| Alaska | | √ | | | | | | | | | | | | | |
| Arizona | | √ | | | | | | | √ | 4 | 3 | | | √ | |
| Arkansas | | √ | | 4 | √ | | | | | | | | | | |
| California | 1 | √ | 1 | 3 | 2 | | | | 2 | √ | | | | √ | |
| Colorado | | √ | | | | | | | √ | 3 | 1 | | | √ | |
| Connecticut | | √ | | | | | | | | | | | | | |
| Delaware | | √ | | | | | | | | | | | | | |
| Florida | | √ | | | | | 2 | | | | | | | | 1 |
| Georgia | | √ | | | 4 | | | | | | | | | | |
| Hawaii | | √ | | | | | | | | | | | | | |
| Idaho | | √ | | | | | 4 | | √ | | | | | 3 | |
| Illinois | | √ | | √ | | | | 1 | | | | | | √ | |
| Indiana | | √ | | √ | | | | | | | | | | | |
| Iowa | | √ | | | | | | | | | | | | | |
| Kansas | | √ | | | | | | | | | | | | √ | |
| Kentucky | | √ | | | | | | | | | | | | √ | |
| Louisiana | | √ | | √ | | | | | | | | | | | |
| Maine | | √ | | | | | | | | | | | | | |
| Maryland | | √ | | | √ | | | | | | | | | | |
| Massachusetts | | √ | | | | | | | | | | | | | |
| Michigan | | 2 | | | | | | | | | | | | | |
| Minnesota | | √ | | | | | | | | | | | | | |
| Mississippi | | √ | | | | | | | | | | | | | |
| Missouri | | √ | | | | | | | | | | | | √ | |
| Montana | | √ | | √ | √ | | | | | | | 1 | | 1 | |
| Nebraska | | √ | | | | | | | | | | | | | |
| Nevada | | √ | | | √ | | | | 1 | √ | | | | √ | |
| New Hampshire | | | | | | | | | | | | | | | |
| New Jersey | | √ | | √ | | | | | | | | | | √ | |
| New Mexico | | √ | | √ | | | | | √ | 1 | 4 | | | √ | |
| New York | | √ | | | 1 | | 1 | | | | | | 1 | 2 | |
| North Carolina | | √ | | | 3 | | | | 3 | | | | | | |
| North Dakota | | √ | | √ | | | | | | | | | | | |
| Ohio | | 3 | | √ | | | | | | | | | | | |
| Oklahoma | | √ | | √ | | | | 2 | | | | | | √ | |
| Oregon | | √ | | | | | | | | | | | | | |
| Pennsylvania | | 1 | | √ | √ | | | 3 | | | | | | | |
| Rhode Island | | √ | | | | | | | | | | | | | |
| South Carolina | | √ | | | | | √ | | | | | 2 | | | |
| South Dakota | | √ | | | | | | | | | | | | | |
| Tennessee | | √ | | | | | | | | | | | | 4 | |
| Texas | 2 | 4 | | 1 | √ | | | | | √ | | | | | |
| Utah | | √ | | | | | | | √ | 2 | 2 | | | √ | |
| Vermont | | √ | | | √ | | | | | | | | | | |
| Virginia | | √ | | | √ | | 3 | | | | | | | √ | |
| Washington | | √ | 2 | | √ | | | | √ | √ | | | | √ | |
| West Virginia | | √ | | √ | | | | | | | | | | | |
| Wisconsin | | √ | | | | | | | | | | | | √ | |
| Wyoming | 3 | √ | | 2 | | | | | √ | √ | √ | | | | |

[1] Includes Alaska and Hawaii.

Digitized by Google

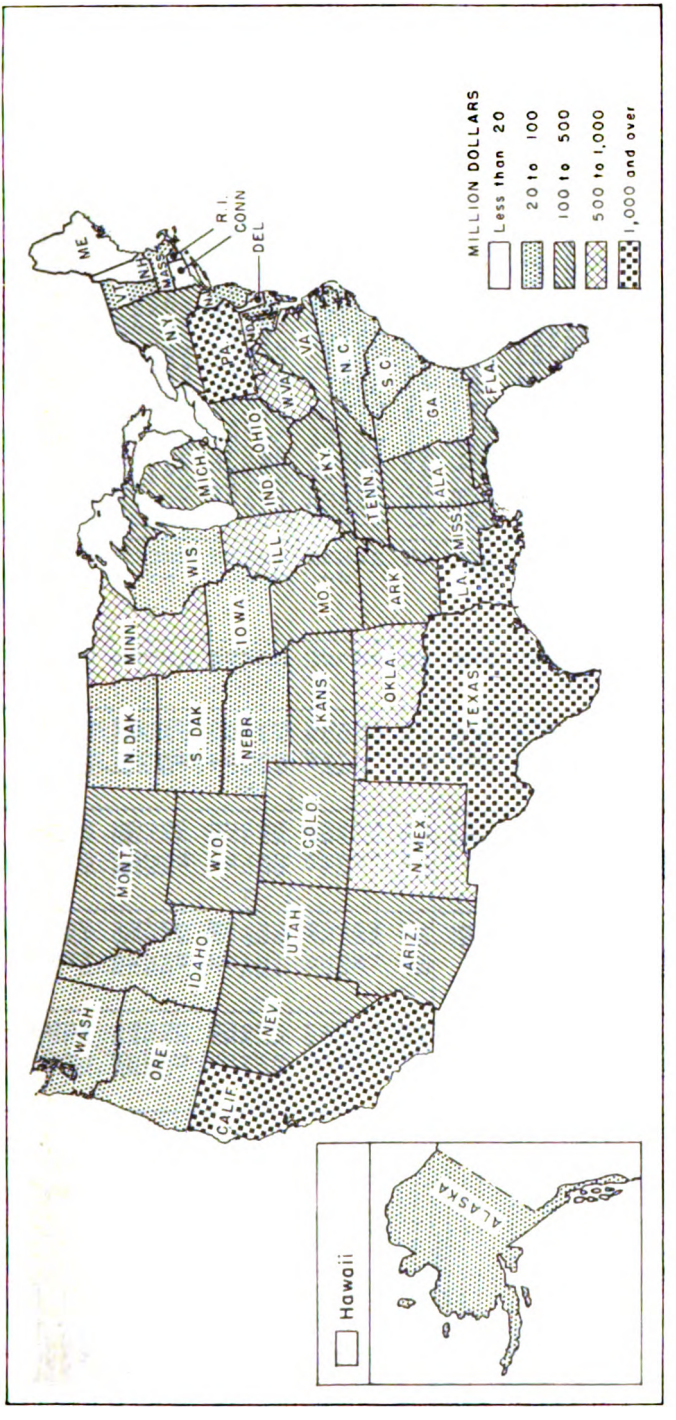



FIGURE 2.—Value of mineral production in the United States (including Alaska and Hawaii), 1956, by States

Digitized by Google

TABLE 4.—Value of mineral production in the United States,[1] 1953–56, by States, in thousand dollars, and principal minerals produced in 1956

| State | 1953 | 1954 | 1955 | 1956 | | | |
|---|---|---|---|---|---|---|---|
| | | | | Value | Rank | Percent of U. S. total | Principal minerals in order of value |
| Alabama | 187,087 | 154,639 | 186,453 | 189,186 | 22 | 1.09 | Coal, cement, iron ore, stone. |
| Alaska | 24,252 | 24,408 | 25,412 | 23,408 | 42 | .13 | Gold, coal, sand and gravel, platinum-group metals. |
| Arizona | 258,471 | 254,479 | 378,277 | 485,751 | 11 | 2.80 | Copper, cement, zinc, uranium. |
| Arkansas | 127,090 | 131,745 | 132,822 | 135,210 | 26 | .78 | Petroleum, bauxite, sand and gravel, stone. |
| California | 1,393,987 | 1,429,627 | 1,456,513 | 1,555,263 | 2 | 8.97 | Petroleum, cement, natural gas, natural-gas liquids. |
| Colorado | 212,690 | 255,852 | 286,219 | 329,450 | 16 | 1.90 | Petroleum, molybdenum, coal, cement. |
| Connecticut | 7,917 | 9,581 | 10,428 | 11,876 | 46 | .07 | Stone, sand and gravel, lime, clays. |
| Delaware | 659 | 947 | 1,658 | 1,232 | 50 | .01 | Sand and gravel, stone, clays. |
| District of Columbia | 15 | | | | | | |
| Florida | 92,336 | 106,510 | 108,957 | 140,490 | 24 | .81 | Phosphate rock, stone, cement, titanium concentrate. |
| Georgia | 51,395 | 55,828 | 60,417 | 67,912 | 31 | .39 | Clays, stone, cement, sand and gravel. |
| Hawaii | 3,332 | 3,596 | 3,592 | 6,972 | 47 | .04 | Stone, sand and gravel, lime, pumice. |
| Idaho | 67,063 | 69,689 | 68,513 | 75,178 | 29 | .43 | Lead, zinc, silver, phosphate rock. |
| Illinois | 462,443 | 473,077 | 533,062 | 572,321 | 7 | 3.30 | Petroleum, coal, stone, sand and gravel. |
| Indiana | 169,781 | 165,369 | 183,479 | 195,674 | 21 | 1.13 | Coal, cement, petroleum, stone. |
| Iowa | 51,994 | 58,798 | 63,555 | 66,529 | 32 | .38 | Cement, stone, sand and gravel, coal. |
| Kansas | 413,231 | 449,587 | 470,830 | 493,307 | 10 | 2.85 | Petroleum, natural gas, cement, stone. |
| Kentucky | 381,742 | 327,503 | 391,068 | 443,168 | 12 | 2.56 | Coal, petroleum, natural gas, stone. |
| Louisiana | 965,237 | 998,057 | 1,156,637 | 1,281,849 | 3 | 7.39 | Petroleum, natural gas, natural-gas liquids, sulfur. |
| Maine | 10,503 | 10,716 | 12,991 | 12,179 | 45 | .07 | Cement, sand and gravel, stone, slate. |
| Maryland | 27,085 | 30,743 | 35,491 | 40,532 | 38 | .23 | Stone, sand and gravel, cement, coal. |
| Massachusetts | 17,191 | 18,851 | 22,109 | 25,085 | 41 | .14 | Stone, sand and gravel, lime, clays. |
| Michigan | 286,487 | 279,940 | 363,787 | 394,536 | 14 | 2.27 | Iron ore, cement, copper, salt. |
| Minnesota | 542,545 | 351,474 | 501,151 | 501,027 | 9 | 2.89 | Iron ore, sand and gravel, stone, cement. |
| Mississippi | 107,868 | 110,563 | 122,620 | 133,098 | 27 | .77 | Petroleum, natural gas, sand and gravel, cement. |
| Missouri | 128,207 | 131,280 | 151,626 | 163,693 | 23 | .94 | Lead, cement, stone, lime. |
| Montana | 132,184 | 126,412 | 166,993 | 213,728 | 19 | 1.23 | Copper, petroleum, zinc, sand and gravel. |
| Nebraska | 33,281 | 42,393 | 54,237 | 71,776 | 30 | .41 | Petroleum, cement, sand and gravel, stone. |
| Nevada | 73,523 | 89,138 | 113,220 | 126,233 | 28 | .73 | Copper, tungsten concentrate, manganese ore, sand and gravel. |
| New Hampshire | 1,805 | 2,112 | 2,605 | 3,436 | 48 | .02 | Sand and gravel, stone, mica, feldspar. |
| New Jersey | 51,945 | 47,044 | 57,495 | 64,279 | 34 | .37 | Stone, sand and gravel, iron ore, magnesium compounds. |
| New Mexico | 336,545 | 373,519 | 436,494 | 513,303 | 8 | 2.96 | Petroleum, potassium salts, copper, natural gas. |
| New York | 186,868 | 192,738 | 216,907 | 237,016 | 18 | 1.37 | Cement, iron ore, stone, sand and gravel. |
| North Carolina | 38,451 | 41,651 | 41,210 | 39,985 | 39 | .23 | Stone, tungsten concentrate, sand and gravel, mica. |
| North Dakota | 19,237 | 22,223 | 44,123 | 53,555 | 36 | .31 | Petroleum, coal, sand and gravel, natural-gas liquids. |

Digitized by Google

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ohio | 302,242 | 293,659 | 340,457 | 375,488 | 15 | 2.16 | Coal, stone, cement, lime. |
| Oklahoma | 679,003 | 650,205 | 711,089 | 757,116 | 6 | 4.37 | Petroleum, natural gas, natural-gas liquids, stone. |
| Oregon | 24,449 | 32,268 | 31,736 | 34,011 | 40 | .20 | Sand and gravel, cement, stone, nickel. |
| Pennsylvania | 1,121,622 | 925,545 | 969,910 | 1,088,867 | 4 | 6.28 | Coal, cement, stone, petroleum. |
| Rhode Island | 1,462 | 1,461 | 1,834 | 1,627 | 49 | .01 | Sand and gravel, stone, graphite. |
| South Carolina | 17,771 | 17,744 | 20,197 | 21,342 | 44 | .12 | Cement, clays, stone, sand and gravel. |
| South Dakota | 33,823 | 37,874 | 40,526 | 41,797 | 37 | .24 | Gold, sand and gravel, stone, cement. |
| Tennessee | 98,050 | 105,686 | 119,316 | 137,846 | 25 | .79 | Coal, cement, stone, zinc. |
| Texas | 3,647,913 | 3,730,705 | 3,993,310 | 4,211,284 | 1 | 24.28 | Petroleum, natural gas, natural-gas liquids, sulfur. |
| Utah | 298,589 | 255,495 | 331,929 | 396,942 | 13 | 2.29 | Copper, coal, iron ore, uranium. |
| Vermont | 20,302 | 20,483 | 23,884 | 23,131 | 43 | .13 | Stone, slate, asbestos, copper. |
| Virginia | 152,979 | 129,603 | 172,541 | 208,806 | 20 | 1.20 | Coal, stone, cement, sand and gravel. |
| Washington | 54,577 | 53,300 | 67,334 | 61,665 | 35 | .36 | Cement, sand and gravel, stone, zinc. |
| West Virginia | 790,110 | 636,311 | 755,512 | 935,074 | 5 | 5.39 | Coal, natural gas, natural-gas liquids, stone. |
| Wisconsin | 55,212 | 54,286 | 65,813 | 65,860 | 33 | .38 | Stone, sand and gravel, iron ore, zinc. |
| Wyoming | 255,906 | 281,306 | 297,752 | 316,897 | 17 | 1.83 | Petroleum, clays, coal, sodium salts. |
| Total | 14,418,000 | 14,066,000 | 15,804,000 | 17,346,000 | ------- | 100.00 | Petroleum, coal, natural gas, cement. |

[1] Includes Alaska and Hawaii.

Digitized by Google

## TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States

### ALABAMA

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Cement [3]—thousand 376-pound barrels | 10,428 | 25,701 | 11,122 | 28,583 | 13,721 | 38,350 | 14,065 | 41,840 |
| Clays—thousand short tons | 1,198 | 1,816 | 1,331 | 2,258 | (4) | (4) | [5] 2,195 | [5] 2,147 |
| Coal—do | 12,532 | 79,370 | 10,283 | 67,338 | 13,088 | 79,337 | 12,663 | 79,322 |
| Iron ore (usable)—thousand long tons, gross weight | 7,446 | 55,640 | 5,913 | 33,327 | 6,814 | 44,657 | 5,633 | 34,825 |
| Lime | 470,541 | 5,018 | 421,807 | 4,488 | 462,194 | 5,186 | 466,399 | 5,089 |
| Mica (sheet) | (4) | (4) | (4) | (4) | (4) | (4) | 1,122 | 7 |
| Natural gas—million cubic feet | 41 | 2 | 87 | 5 | 282 | 20 | 42 | 3 |
| Petroleum (crude)—thousand 42-gallon barrels | 1,694 | 3,290 | 1,584 | 3,690 | 1,411 | 2,910 | 3,069 | 7,335 |
| Sand and gravel—thousand short tons | 3,711 | 3,003 | 3,966 | 3,451 | 3,680 | 3,524 | 4,999 | 4,621 |
| Stone (except for cement and lime, 1953)—do | 3,957 | 8,155 | 7,394 | 11,609 | 8,269 | 11,867 | [5] 12,343 | [5] 14,702 |
| Talc | | | | | 1,500 | 8 | 2,200 | 5 |
| Value of items that cannot be disclosed: Native asphalt, bauxite, pozzolan cement, clays (kaolin), graphite (1953), scrap mica, salt, stone (dimension limestone and marble), and values indicated by footnote 4 | | 5,092 | | 4,856 | | 4,325 | | 4,083 |
| Total Alabama | | 187,087 | | [7] 154,639 | | [7] 186,453 | | [7] 189,186 |

### ALASKA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Antimony ore and concentrate—antimony content | | | | | | | 28 | (4) |
| Chromite—gross weight | | | 2,953 | 208 | 7,082 | 625 | 7,193 | 711 |
| Clays—thousand short tons | | | (4) | (4) | 1 | 4 | | |
| Coal—do | 861 | 8,451 | 667 | 6,442 | 640 | 5,759 | 727 | 6,374 |
| Copper (recoverable content of ores, etc.) | | | 4 | 2 | 1 | 1 | | |
| Gold (recoverable content of ores, etc.)—troy ounces | 253,783 | 8,882 | 248,511 | 8,698 | 249,294 | 8,725 | 209,296 | 7,325 |
| Lead (recoverable content of ores, etc.) | 9 | 2 | | | 1 | (3) | 1 | (3) |
| Mercury—76-pound flasks | 40 | 8 | 1,046 | 277 | (4) | (4) | 3,280 | 853 |
| Sand and gravel—thousand short tons | 7,689 | 5,080 | 6,640 | 6,302 | 9,793 | 8,242 | 5,955 | 5,880 |
| Silver (recoverable content of ores, etc.)—troy ounces | 35,387 | 32 | 33,697 | 31 | 33,693 | 31 | 28,360 | 26 |
| Stone—thousand short tons | 47 | 170 | 284 | 466 | 266 | 290 | 195 | 595 |
| Tin (content of concentrate)—long tons | 49 | 106 | 199 | 410 | 86 | 183 | | |
| Tungsten ore and concentrate—60-percent $WO_3$ basis | 3 | (4) | | | | | | |
| Value of items that cannot be disclosed: Gem stones (1953–54, 1956), platinum group metals, and values indicated by footnote 4 | | 1,521 | | 1,572 | | 1,552 | | 1,644 |
| Total Alaska | | 24,252 | | 24,408 | | 25,412 | | 23,408 |

Digitized by Google

## ARIZONA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Beryllium concentrate—gross weight | (4) | (4) | (4) | (4) | (4) | (4) | 6 | 3 |
| Brucite | 100 | 1 | | | | | | |
| Clays—thousand short tons | 197 | 715 | 254 | 814 | 254 | 869 | [5] 112 | [5] 168 |
| Coal—do | 5 | 32 | 11 | 68 | 9 | 59 | 10 | 66 |
| Copper (recoverable content of ores, etc.) | 393, 525 | 225, 883 | 377, 927 | 222, 977 | 454, 105 | 338, 762 | 506 | 430, 022 |
| Fluorspar | 1, 951 | 113 | (4) | (4) | | | | |
| Gem stones | (3) | (4) | (3) | (4) | (3) | 97 | (3) | 104 |
| Gold (recoverable content of ores, etc.)—troy ounces | 112, 824 | 3, 949 | 114, 809 | 4, 018 | 127, 616 | 4, 467 | 146, 110 | 5, 114 |
| Gypsum | 13, 484 | 44 | (4) | (4) | (4) | (4) | 95, 666 | 366 |
| Lead (recoverable content of ores, etc.) | 9, 428 | 2, 470 | 8, 385 | 2, 297 | 9, 817 | 2, 925 | 11, 999 | 3, 768 |
| Lime | 96, 408 | 1, 238 | 88, 932 | 1, 131 | 112, 028 | 1, 438 | 126, 876 | 1, 756 |
| Manganese ore (35 percent or more Mn)—gross weight | (4) | (4) | | | 1, 444 | (4) | 42, 008 | 3, 468 |
| Mercury—76-pound flasks | | | 163 | 43 | 477 | 138 | (4) | (4) |
| Mica (scrap) | 3, 721 | 115 | 1, 682 | 18 | 1, 353 | 9 | | |
| Molybdenum (content of concentrate)—thousand pounds | 1, 447 | 1, 426 | 1, 538 | 1, 525 | 1, 497 | 1, 511 | 2, 392 | 2, 670 |
| Natural gas—million cubic feet | | | | | (4) | (4) | 21 | 3 |
| Perlite | 1, 511 | 10 | 1, 296 | 7 | 10, 568 | 84 | 15, 928 | 108 |
| Pumice | 123, 797 | 426 | 80, 883 | 126 | 92, 136 | 373 | 114, 609 | 366 |
| Sand and gravel—thousand short tons | 3, 447 | 2, 681 | 3, 764 | 3, 067 | 7, 755 | 6, 519 | 7, 932 | 6, 167 |
| Silver (recoverable content of ores, etc.)—troy ounces | 4, 351, 429 | 3, 938 | 4, 298, 811 | 3, 891 | 4, 634, 179 | 4, 194 | 5, 179, 185 | 4, 687 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | 442 | 619 | 1, 205 | 1, 914 | 1, 601 | 2, 329 | 1, 623 | 2, 474 |
| Tungsten concentrate—60-percent $WO_3$ basis | 134 | 469 | 132 | 457 | 181 | 676 | 186 | 637 |
| Zinc (recoverable content of ores, etc.) | 27, 530 | 6, 332 | 21, 461 | 4, 636 | 22, 684 | 5, 580 | 25, 580 | 7, 009 |
| Value of items that cannot be disclosed: Asbestos, barite (1953–55), cement, clays (bentonite, 1955), columbium-tantalum concentrate (1955), diatomite (1954–55), feldspar, quartz (1953), rare-earth metals concentrates (1955), uranium ore (1955), vanadium, vermiculite (1953–54), and values indicated by footnote 4 | | 8, 010 | | 8, 172 | | 9, 201 | | 17, 901 |
| Total Arizona | | 258, 471 | | [7] 254, 479 | | [7] 378, 277 | | [7] 485, 751 |

## ARKANSAS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Abrasive stones (whetstones) | (4) | (4) | (4) | (4) | (4) | (4) | 35 | 11 |
| Barite | 380, 763 | 3, 945 | 370, 621 | 3, 489 | 462, 986 | 3, 755 | 486, 254 | 4, 256 |
| Bauxite—long tons, dried equivalent | 1, 529, 976 | 12, 976 | 1, 949, 368 | 15, 994 | 1, 721, 243 | 14, 026 | 1, 668, 432 | 13, 307 |
| Clays—thousand short tons | 229 | 1, 734 | 617 | 2, 556 | 739 | 2, 376 | 719 | 1, 636 |
| Coal—do | 775 | 6, 144 | 477 | 3, 589 | 573 | 4, 319 | 890 | 4, 601 |
| Gem stones | | | | | (3) | 4 | (3) | 25 |
| Iron ore (usable)—thousand long tons, gross weight | (10) | (4) | (10) | (4) | | | (4) | (4) |
| Manganese ore (35 percent or more Mn)—gross weight | 6, 123 | 527 | 13, 728 | 1, 021 | 23, 744 | 1, 727 | 29, 485 | 2, 066 |
| Natural gas—million cubic feet | 41, 510 | 2, 200 | 33, 470 | 1, 841 | 32, 123 | 1, 799 | 30, 162 | 1, 810 |
| Natural-gas liquids: | | | | | | | | |
| Natural gasoline and cycle products—thousand gallons | 58, 422 | 4, 123 | 50, 778 | 3, 234 | 47, 483 | 3, 239 | 41, 529 | 2, 541 |
| LP-gases—do | 55, 188 | 2, 562 | 58, 506 | 2, 521 | 57, 088 | 2, 169 | 56, 146 | 2, 293 |
| Petroleum (crude)—thousand 42-gallon barrels | 29, 681 | 77, 170 | 29, 130 | 79, 520 | 28, 369 | 76, 880 | 29, 355 | 78, 965 |

**See footnotes at end of table.**

Digitized by Google

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| **ARKANSAS—Continued** | | | | | | | | |
| Sand and gravel thousand short tons | 4,904 | 4,955 | 6,612 | 6,567 | 9,003 | 7,663 | 10,200 | 8,730 |
| Slate | 34,516 | 316 | 41,845 | 379 | (4) | (4) | (4) | (4) |
| Stone (except limestone for cement and lime, 1953) thousand short tons | 3,545 | 5,070 | 4,604 | 5,930 | 6,176 | 8,026 | 6,325 | 8,113 |
| Value of items that cannot be disclosed: Abrasive stones (oilstones), cement, gypsum, lime, soapstone (1954–56), recovered elemental sulfur and values indicated by footnote 4 | | 5,368 | | 5,742 | | 7,616 | | 8,182 |
| Total Arkansas | | 127,090 | | r 131,745 | | r 132,822 | | r 135,210 |
| **CALIFORNIA** | | | | | | | | |
| Boron minerals | 715,228 | 17,668 | 790,449 | 26,714 | 924,496 | 33,817 | 944,950 | 39,592 |
| Cement thousand 376-pound barrels | 32,002 | 90,873 | 32,762 | 98,251 | 35,087 | 103,804 | 39,290 | 120,511 |
| Chromite gross weight | 26,512 | 2,078 | 30,661 | 2,285 | 22,105 | 1,834 | 27,082 | 2,192 |
| Clays thousand short tons | 2,430 | 4,953 | 2,723 | 4,477 | 2,860 | 5,027 | 2,982 | 6,137 |
| Coal (lignite) do | | | (4) | (4) | 8 | 77 | 12 | 120 |
| Copper (recoverable content of ores, etc.) | 382 | 219 | 362 | 214 | 613 | 457 | 859 | 730 |
| Gem stones | (9) | (4) | (9) | (4) | (9) | (4) | (9) | 90 |
| Gold (recoverable content of ores, etc.) troy ounces | 234,591 | 8,211 | 237,886 | 8,326 | 251,737 | 8,811 | 193,816 | 6,784 |
| Gypsum | 1,199,489 | 2,856 | 1,161,502 | 2,804 | 1,307,625 | 3,274 | 1,399,390 | 3,402 |
| Iron ore (usable) thousand long tons, gross weight | 1,698 | (4) | 1,270 | (4) | 1,777 | (4) | 2,414 | (4) |
| Lead (recoverable content of ores, etc.) | 8,664 | 2,270 | 2,671 | 732 | 8,265 | 2,463 | 9,296 | 2,919 |
| Lime | 301,422 | 4,653 | 212,381 | 3,388 | 268,009 | 4,373 | 302,479 | 5,078 |
| Magnesium compounds from sea water and bitterns (partly estimated) MgO equivalent | 55,886 | 3,484 | 40,969 | 2,716 | 58,042 | 3,833 | 66,007 | 4,532 |
| Manganese ore (35 percent or more Mn) gross weight | 5,413 | (4) | 831 | 45 | 3,136 | 271 | 6,595 | 595 |
| Manganiferous ore (5 to 35 percent Mn) do | 534 | 10 | (4) | (4) | | | | |
| Marl, calcareous | 6,028 | 21 | 5,464 | 22 | (4) | (4) | 9,017 | 2,344 |
| Mercury 76-pound flasks | 9,290 | 1,793 | 11,262 | 2,978 | 9,875 | 2,867 | 504,458 | 113,503 |
| Natural gas million cubic feet | 531,346 | 104,675 | 507,289 | 104,502 | 538,178 | 119,476 | | |
| Natural-gas liquids: | | | | | | | 876,902 | 84,615 |
| Natural gasoline and cycle products thousand gallons | 910,350 | 85,691 | 923,160 | 89,293 | 929,649 | 89,003 | 410,232 | 21,333 |
| LP-gases do | 397,572 | 21,961 | 396,186 | 22,262 | 360,902 | 19,379 | 18,918 | 215 |
| Peat | 9,196 | 74 | (4) | (4) | (4) | (4) | 15,119 | 135 |
| Perlite | 15,282 | 113 | 14,811 | 103 | 15,653 | 125 | 350,754 | 918,975 |
| Petroleum (crude) thousand 42-gallon barrels | 365,085 | 909,060 | 355,865 | 907,460 | 354,812 | 887,030 | | |

Digitized by Google

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Pumice | 433,105 | 648 | 566,664 | 652 | 797,306 | 1,099 | 634,356 | 2,334 |
| Salt (common) thousand short tons | 1,123 | 6,263 | 1,186 | 6,126 | 1,315 | 6,751 | 1,444 | 7,606 |
| Sand and gravel do | 58,430 | 53,224 | 70,525 | 68,139 | 64,879 | 66,820 | 86,526 | 96,776 |
| Silver (recoverable content of ores, etc.) troy ounces | 1,036,372 | 938 | 309,575 | 280 | 954,181 | 864 | 938,139 | 849 |
| Stone (except limestone for cement and lime, 1953) thousand short tons | [8] 14,497 | [8] 18,473 | 23,304 | 37,541 | 24,708 | 37,164 | 32,583 | 46,109 |
| Strontium minerals | 50 | 1 | 12 | [3] | 177 | 4 | [4] | [4] |
| Sulfur ore long tons | 152,203 | [4] | 185,085 | [4] | 199,599 | [4] | [4] | [4] |
| Talc, pyrophyllite and soapstone | 126,442 | 1,133 | 133,474 | 1,211 | 166,551 | 1,553 | 153,710 | 1,419 |
| Tungsten concentrate 60-percent $WO_3$ basis | 2,382 | 8,939 | 3,512 | 13,209 | 4,383 | 16,201 | 3,719 | 13,449 |
| Zinc (recoverable content of ores, etc.) | 5,358 | 1,232 | 1,415 | 306 | 6,836 | 1,682 | 8,049 | 2,205 |
| Value of items that cannot be disclosed: Asbestos, barite, bromine, calcium-magnesium chloride, carbon dioxide, masonry cement (1956), diatomite, feldspar, abrasive garnet (1954–56), iodine, lithium minerals (1953–54), magnesite, mica (1954–56), molybdenum, platinum group metals (crude), potassium salts, pyrites, quartz (1953), rare-earth metals concentrate, ground sandstone (1953), slate, sodium carbonate and sulfate, stone (dimension and crushed marble 1953), recovered elemental sulfur, titanium iron concentrate (nontitanium use 1953–55), uranium ore (1956), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 42,473 | | 43,738 | | [11] 55,689 | | 69,025 |
| Total California | | 1,393,987 | | [7] 1,429,627 | | [7 11] 1,456,513 | | [7] 1,555,263 |

## COLORADO

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Beryllium concentrate gross weight | 75 | 39 | 60 | 27 | 46 | 23 | 179 | 94 |
| Clays thousand short tons | 778 | 1,430 | 855 | 1,003 | 464 | 1,118 | 523 | 1,215 |
| Coal do | 3,548 | 19,198 | 2,900 | 16,079 | 3,568 | 20,100 | 3,502 | 19,832 |
| Columbium-tantalum concentrate pounds | [4] | [4] | 4,967 | 10 | 4,325 | 7 | 52 | [9] |
| Copper (recoverable content of ores, etc.) | 2,941 | 1,688 | 4,523 | 2,669 | 4,323 | 3,225 | 4,228 | 3,594 |
| Feldspar long tons | 43,508 | 268 | [4] | [4] | 46,114 | 314 | 47,014 | 327 |
| Fluorspar | 53,276 | 2,872 | 59,197 | 3,197 | [4] | [4] | [4] | [4] |
| Gem stones | [9] | [4] | [9] | [4] | [9] | 48 | [9] | 30 |
| Gold (recoverable content of ores, etc.) troy ounces | 119,218 | 4,173 | 96,146 | 3,365 | 88,577 | 3,100 | 97,668 | 3,418 |
| Gypsum | 62,936 | 233 | 64,650 | 253 | 76,649 | 329 | 88,026 | 353 |
| Iron ore (usable) thousand long tons, gross weight | 1 | 4 | 6 | [4] | 4 | [4] | [4] | [4] |
| Lead (recoverable content of ores, etc.) | 21,754 | 5,700 | 17,823 | 4,883 | 15,805 | 4,710 | 19,856 | 6,235 |
| Mica: | | | | | | | | |
| Scrap | 1,599 | 19 | [4] | [4] | 699 | 13 | 517 | 7 |
| Sheet pounds | | | | | | | 8 | [9] |
| Molybdenum thousand pounds | 33,851 | [4] | 42,545 | [4] | 45,837 | [4] | [4] | [4] |
| Natural gas million cubic feet | 28,509 | 1,654 | 45,705 | 3,976 | 49,152 | 4,866 | 54,205 | 5,312 |
| Peat | 6,067 | [4] | 9,028 | [4] | | | | |
| Petroleum (crude) thousand 42-gallon barrels | 36,402 | 98,650 | 46,206 | 127,990 | 52,653 | 144,800 | 58,516 | 162,674 |
| Pumice | 47,919 | 100 | [4] | [4] | 70,530 | 163 | 50,015 | 109 |
| Rare-earth metals concentrates | | | | | [4] | [4] | 16 | 23 |
| Salt thousand short tons | | | | | 4 | 17 | 4 | 18 |
| Sand and gravel do | 12,439 | 8,609 | 13,552 | 9,027 | 12,912 | 8,915 | 15,152 | 11,082 |

**See footnotes at end of table.**

Digitized by Google

## TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

COLORADO—Continued

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Silver (recoverable content of ores, etc.)—troy ounces | 2,200,317 | 1,991 | 3,417,072 | 3,093 | 2,772,073 | 2,509 | 2,284,701 | 2,068 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | [6] 884 | [6] 1,751 | 1,804 | 2,112 | 2,149 | 3,508 | 2,250 | 5,217 |
| Tungsten concentrate—60-percent $WO_3$ basis | 817 | 2,902 | 927 | 3,421 | 1,152 | 4,079 | 873 | 3,010 |
| Uranium ore | | | | | | | 495,450 | 12,000 |
| Vanadium | | | | | | | 5,582,484 | [4] |
| Zinc (recoverable content of ores, etc.) | 4,530,612 | [4] | 4,528,472 | [4] | 4,595,359 | [4] | 40,246 | 11,027 |
| Value of items that cannot be disclosed: Carbon dioxide, cement, lithium minerals (1953–54), natural-gas liquids, perlite, pyrites, stone (crushed basalt 1953), tin (1953–55), vermiculite (1954), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | 37,809 | 8,696 | 35,150 | 7,592 | 35,350 | 8,696 | | |
| | | 52,713 | | 67,874 | | [11] 76,969 | | 83,578 |
| Total Colorado | | 212,690 | | [7] 255,852 | | [7 11] 286,219 | | [7] 329,450 |

CONNECTICUT

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Beryllium concentrate—gross weight | 33 | 14 | 13 | 8 | 5 | 3 | [4] | [4] |
| Clays—thousand short tons | 438 | 448 | 289 | 285 | 325 | 315 | 338 | 390 |
| Feldspar—long tons | 9,829 | 63 | 9,280 | 60 | [4] | [4] | [4] | [4] |
| Lime | [4] | [4] | [4] | [4] | 34,917 | 503 | 30,748 | 609 |
| Mica (sheet and scrap) | [4] | | [4] | [4] | 3 | 13 | [12] 310 | [12] 2 |
| Peat | 7,475 | 31 | 5,856 | 24 | [4] | [4] | 22,315 | 152 |
| Sand and gravel—thousand short tons | 3,026 | 2,348 | 4,846 | 4,315 | 4,345 | 4,080 | 4,369 | 4,101 |
| Stone (except limestone for lime, 1953)—do | [6] 2,827 | [6] 4,235 | 2,829 | 4,269 | 3,642 | 5,451 | [6] 4,428 | [6] 6,590 |
| Value of items that cannot be disclosed: Columbium-tantalum concentrate (1953–55), stone (dimension basalt 1953, crushed granite and dimension limestone 1955, dimension limestone, 1956) and values indicated by footnote 4 | | 778 | | 725 | | 123 | | 124 |
| Total Connecticut | | 7,917 | | [7] 9,581 | | [7] 10,428 | | [7] 11,876 |

DELAWARE

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sand and gravel—thousand short tons | 521 | 400 | 972 | 752 | 2,297 | 1,407 | 1,160 | 967 |
| Stone—do | 80 | 215 | [4] | [4] | 79 | 228 | 83 | 232 |
| Value of items that cannot be disclosed: Nonmetals and values indicated by footnote 4 | | 44 | | 195 | | 23 | | 33 |
| Total Delaware | | 659 | | 947 | | 1,658 | | 1,232 |

Digitized by Google

## FLORIDA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 258 | 2,952 | 372 | 3,337 | 413 | 4,816 | 432 | 5,826 |
| Lime | | (4) | (4) | (4) | (4) | (4) | (4) | 39,542 | 490 |
| Natural gas | million cubic feet | 34 | 2 | 35 | 3 | 36 | 4 | 35 | 3 |
| Peat | | 27,678 | 186 | 37,449 | 168 | 61,098 | 232 | 58,496 | 203 |
| Petroleum (crude) | thousand 42-gallon barrels | 543 | (4) | 548 | (4) | 495 | (4) | (4) | (4) |
| Phosphate rock | thousand long tons | 9,331 | 56,525 | 10,437 | 64,500 | 8,747 | 53,640 | 11,822 | 74,290 |
| Sand and gravel | thousand short tons | 3,731 | 3,199 | 3,469 | 2,661 | 5,066 | 4,349 | 5,815 | 5,034 |
| Stone (except limestone for cement and lime, 1953) | | 6 9,429 | 6 11,309 | 6 14,225 | 6 16,832 | 6 17,028 | 6 22,966 | 18,779 | 25,183 |
| Titanium concentrate: | | | | | | | | | |
| Ilmenite | gross weight | 151,109 | 2,322 | 157,157 | 2,412 | (4) | (4) | (4) | (4) |
| Rutile | do | 6,476 | 703 | 7,305 | 869 | 9,182 | 1,122 | (4) | (4) |
| Zirconium concentrate | | 21,234 | 794 | 17,959 | 820 | 28,913 | 1,425 | 43,794 | 2,160 |
| Value of items that cannot be disclosed: Cement, abrasive garnet, gem stones (1956)), rare-earth metals concentrates (1956), stone (dimension limestone (1953–55)), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 14,344 | | 15,956 | | 22,787 | | 28,452 |
| Total Florida | | | 92,336 | | 7 106,510 | | 7 108,957 | | 7 140,490 |

## GEORGIA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 2,651 | 23,455 | 2,711 | 24,107 | 2,953 | 26,145 | 3,047 | 29,501 |
| Coal | do | 14 | 71 | 8 | 41 | 12 | 62 | 8 | 42 |
| Gold (recoverable content of ores, etc.) | troy ounces | 2 | (5) | | | | | | |
| Iron ore (usable) | thousand long tons, gross weight | 260 | 1,101 | 222 | 872 | 257 | 994 | 357 | 1,609 |
| Iron oxide pigments | | | | (4) | (4) | 6,139 | 36 | (4) | (4) |
| Lime | | 9,345 | 95 | (4) | (4) | | | | |
| Mica (sheet) | pounds | 14,063 | 74 | (4) | (4) | (4) | (4) | 20,149 | 150 |
| Peat | | 2,305 | (4) | 5,150 | 61 | (4) | (4) | 6,225 | 48 |
| Sand and gravel | thousand short tons | 2,051 | 1,901 | 2,703 | 2,466 | 2,988 | 2,199 | 2,426 | 2,183 |
| Stone (except limestone for cement and lime, 1953) | do | 7,112 | 17,756 | 8,058 | 21,384 | 6 7,488 | 6 14,250 | 6 9,196 | 6 20,714 |
| Talc and soapstone | | 57,891 | 203 | 50,536 | 177 | 53,828 | 118 | 57,916 | 122 |
| Value of items that cannot be disclosed: Asbestos (1953–54), barite, bauxite (1955–56), beryllium concentrate, cement, feldspar (1954–56), gem stones (1955–56), manganese ore (1954–56), manganiferous ore (1955–56), scrap mica, ground sand and sandstone (1953), slate, stone (dimension and crushed marble and crushed sandstone 1955, crushed marble and crushed sandstone, 1956), and minerals indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 6,739 | | 7,481 | | 17,495 | | 14,558 |
| Total Georgia | | | 51,395 | | 7 55,828 | | 7 60,417 | | 7 67,912 |

**See footnotes at end of table.**

Digitized by Google

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| **COLORADO—Continued** | | | | | | | | |
| Silver (recoverable content of ores, etc.)—troy ounces | 2,200,317 | 1,991 | 3,417,072 | 3,093 | 2,772,073 | 2,509 | 2,284,701 | 2,068 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | [6] 884 | [6] 1,751 | 1,804 | 2,112 | 2,149 | 3,508 | 2,250 | 5,217 |
| Tungsten concentrate—60-percent $WO_3$ basis | 817 | 2,902 | 927 | 3,421 | 1,152 | 4,079 | 873 | 3,010 |
| Uranium ore | | | | | | | 495,450 | 12,000 |
| Vanadium | | | | | | | 5,582,484 | (4) |
| Zinc (recoverable content of ores, etc.) | 4,530,612 | (4) | 4,528,472 | (4) | 4,595,359 | (4) | 40,246 | 11,027 |
| Value of items that cannot be disclosed: Carbon dioxide, cement, lithium minerals (1953–54), natural-gas liquids, perlite, pyrites, stone (crushed basalt 1953), tin (1953–55), vermiculite (1954), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | 37,809 | 8,696 | 35,150 | 7,592 | 35,350 | 8,696 | | |
| | | 52,713 | | 67,874 | | [11] 76,969 | | 83,578 |
| Total Colorado | | 212,690 | | [7] 255,852 | | [7 11] 286,219 | | [7] 329,450 |
| **CONNECTICUT** | | | | | | | | |
| Beryllium concentrate—gross weight | 33 | 14 | 13 | 8 | 5 | 3 | (4) | (4) |
| Clays—thousand short tons | 438 | 448 | 289 | 285 | 325 | 315 | 338 | 390 |
| Feldspar—long tons | 9,829 | 63 | 9,280 | 60 | (4) | (4) | (4) | (4) |
| Lime | (4) | (4) | (4) | (4) | 34,917 | 503 | 39,748 | 609 |
| Mica (sheet and scrap) | (4) | | (4) | | 3 | 13 | [12] 310 | [12] 2 |
| Peat | 7,475 | 31 | 5,856 | 24 | (4) | (4) | 22,315 | 152 |
| Sand and gravel—thousand short tons | 3,026 | 2,348 | 4,846 | 4,315 | 4,345 | 4,080 | 4,369 | 4,101 |
| Stone (except limestone for lime, 1953)—do | [6] 2,827 | [6] 4,235 | 2,829 | 4,269 | 3,642 | 5,451 | [6] 4,428 | [6] 6,590 |
| Value of items that cannot be disclosed: Columbium-tantalum concentrate (1953–55), stone (dimension basalt 1953, crushed granite and dimension limestone 1955, dimension limestone, 1956) and values indicated by footnote 4 | | 778 | | 725 | | 123 | | 124 |
| Total Connecticut | | 7,917 | | [7] 9,581 | | [7] 10,428 | | [7] 11,876 |
| **DELAWARE** | | | | | | | | |
| Sand and gravel—thousand short tons | 521 | 400 | 972 | 752 | 2,297 | 1,407 | 1,160 | 967 |
| Stone—do | 80 | 215 | (4) | (4) | 79 | 228 | 83 | 232 |
| Value of items that cannot be disclosed: Nonmetals and values indicated by footnote 4 | | 44 | | 195 | | 23 | | 33 |
| Total Delaware | | 659 | | 947 | | 1,658 | | 1,232 |

## FLORIDA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 258 | 2,952 | 372 | 3,337 | 413 | 4,816 | 432 | 5,826 |
| Lime | | (4) | (4) | (4) | (4) | (4) | (4) | 39,542 | 490 |
| Natural gas | million cubic feet | 34 | 2 | 35 | 3 | 36 | 4 | 35 | 3 |
| Peat | | 27,678 | 186 | 37,449 | 168 | 61,098 | 232 | 58,496 | 203 |
| Petroleum (crude) | thousand 42-gallon barrels | 543 | (4) | 548 | (4) | 495 | (4) | (4) | (4) |
| Phosphate rock | thousand long tons | 9,331 | 56,525 | 10,437 | 64,500 | 8,747 | 53,640 | 11,822 | 74,290 |
| Sand and gravel | thousand short tons | 3,731 | 3,199 | 3,469 | 2,661 | 5,066 | 4,349 | 5,815 | 5,034 |
| Stone (except limestone for cement and lime, 1953) | | [6] 9,429 | [6] 11,309 | [6] 14,225 | [6] 16,832 | [6] 17,028 | [6] 22,966 | 18,779 | 25,183 |
| Titanium concentrate: | | | | | | | | | |
| Ilmenite | gross weight | 151,109 | 2,322 | 157,157 | 2,412 | (4) | (4) | (4) | (4) |
| Rutile | do | 6,476 | 703 | 7,305 | 869 | 9,182 | 1,122 | (4) | (4) |
| Zirconium concentrate | | 21,234 | 794 | 17,959 | 820 | 28,913 | 1,425 | 43,794 | 2,160 |
| Value of items that cannot be disclosed: Cement, abrasive garnet, gem stones (1956)), rare-earth metals concentrates (1956), stone (dimension limestone (1953–55)), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 14,344 | | 15,956 | | 22,787 | | 28,452 |
| Total Florida | | | 92,336 | | [7] 106,510 | | [7] 108,957 | | [7] 140,490 |

## GEORGIA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 2,651 | 23,455 | 2,711 | 24,107 | 2,953 | 26,145 | 3,047 | 29,501 |
| Coal | do | 14 | 71 | 8 | 41 | 12 | 62 | 8 | 42 |
| Gold (recoverable content of ores, etc.) | troy ounces | 2 | (5) | | | | | | |
| Iron ore (usable) | thousand long tons, gross weight | 260 | 1,101 | 222 | 872 | 257 | 994 | 357 | 1,609 |
| Iron oxide pigments | | | | (4) | (4) | 6,139 | 36 | (4) | (4) |
| Lime | | 9,345 | 95 | (4) | (4) | | | | |
| Mica (sheet) | pounds | 14,063 | 74 | (4) | (4) | (4) | (4) | 20,149 | 150 |
| Peat | | 2,305 | (4) | 5,150 | 61 | (4) | (4) | 6,225 | 48 |
| Sand and gravel | thousand short tons | 2,051 | 1,901 | 2,703 | 2,466 | 2,988 | 2,199 | 2,426 | 2,183 |
| Stone (except limestone for cement and lime, 1953) | do | 7,112 | 17,756 | 8,058 | 21,384 | [6] 7,488 | [6] 14,250 | [6] 9,196 | [6] 20,714 |
| Talc and soapstone | | 57,891 | 203 | 50,536 | 177 | 53,828 | 118 | 57,916 | 122 |
| Value of items that cannot be disclosed: Asbestos (1953–54), barite, bauxite (1955–56), beryllium concentrate, cement, feldspar (1954–56), gem stones (1955–56), manganese ore (1954–56), manganiferous ore (1955–56), scrap mica, ground sand and sandstone (1953), slate, stone (dimension and crushed marble and crushed sandstone 1955, crushed marble and crushed sandstone, 1956), and minerals indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 6,739 | | 7,481 | | 17,495 | | 14,558 |
| Total Georgia | | | 51,395 | | [7] 55,828 | | [7] 60,417 | | [7] 67,912 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued**

**HAWAII**

| Minera | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Clays thousand short tons | (4) | (4) | (4) | (4) | (4) | (4) | 2 | 2 |
| Lime | 7,431 | 224 | 8,375 | 251 | 6,453 | 202 | 9,555 | 306 |
| Pumice | | | (4) | (4) | 130,306 | 76 | 58,851 | 92 |
| Salt thousand short tons | (4) | (4) | (4) | (4) | (4) | (4) | (10) | 18 |
| Sand and gravel do | 111 | 157 | 119 | 319 | 165 | 426 | 193 | 503 |
| Stone do | [6] 1,300 | [6] 2,654 | 1,485 | 2,993 | 1,414 | 2,884 | 3,494 | 6,076 |
| Value of items that cannot be disclosed: Other nonmetals and values indicated by footnote 4 | | 297 | | 59 | | 22 | | |
| Total Hawaii | | 3,332 | | [13] 3,596 | | [13] 3,592 | | [13] 6,972 |

**IDAHO**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Antimony ore and concentrate antimony content | (4) | (4) | 764 | (4) | 633 | (4) | 549 | (4) |
| Beryllium concentrate gross weight | 1 | 1 | (4) | (4) | | | | |
| Clays thousand short tons | 26 | 21 | (4) | (4) | 35 | 30 | [5] 23 | [5] 13 |
| Cobalt (content of concentrate) pounds | 1,211,039 | (4) | 1,702,272 | (4) | 1,691,334 | (4) | 2,385,013 | (4) |
| Columbium-tantalum concentrate do | (4) | (4) | | | (4) | (4) | 215,900 | (4) |
| Copper (recoverable content of ores, etc.) | 3,136 | 1,800 | 4,828 | 2,848 | 5,618 | 4,191 | 6,656 | 5,658 |
| Gold (recoverable content of ores, etc.) troy ounces | 17,630 | 617 | 13,245 | 463 | 10,572 | 370 | 10,029 | 351 |
| Gypsum | 150 | (8) | (4) | (4) | (4) | (4) | | |
| Iron ore (usable) thousand long tons | | | | | | | 1 | (4) |
| Lead (recoverable content of ores, etc.) | 74,610 | 19,548 | 69,302 | 18,989 | 64,163 | 19,121 | 64,231 | 20,197 |
| Mercury 76-pound flasks | (4) | (4) | 609 | 161 | 1,107 | 321 | 3,394 | 882 |
| Mica, sheet pounds | 24,216 | 223 | (4) | (4) | (4) | (4) | | |
| Nickel (content of ore and concentrate) | 11 | (4) | 13 | (4) | 33 | (4) | 49 | (4) |
| Peat | | | 500 | (4) | (4) | (4) | | |
| Phosphate rock thousand long tons | 1,002 | 4,150 | 1,093 | 5,687 | 1,330 | 6,038 | 1,438 | 6,539 |
| Pumice | 85,224 | 160 | (4) | (4) | (4) | (4) | 101,913 | 206 |
| Sand and gravel thousand short tons | 3,776 | 2,841 | 6,718 | 4,569 | 8,652 | 3,934 | 7,874 | 5,661 |
| Sand and sandstone (ground) | 5,304 | 44 | (14) | (14) | (14) | (14) | (14) | (14) |
| Silver (recoverable content of ores, etc.) troy ounces | 14,639,740 | 13,250 | 15,867,414 | 14,361 | 13,831,458 | 12,518 | 13,471,916 | 12,193 |
| Stone (except limestone for cement, 1953) thousand short tons | 1,142 | 2,261 | 2,329 | 3,013 | 1,525 | 1,866 | 1,791 | 2,752 |
| Titanium concentrate gross weight | 1,585 | 8 | | | 1,330 | 7 | 48,619 | 261 |
| Tungsten concentrate 60-percent $WO_3$ basis | 441 | 1,666 | 471 | (4) | 642 | (4) | 582 | (4) |
| Zinc (recoverable content of ores, etc.) | 72,153 | 16,595 | 61,528 | 13,290 | 53,314 | 13,115 | 49,561 | 13,580 |

Digitized by Google

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Value of items that cannot be disclosed: Barite, cement, fire clay (1956), abrasive garnet, gem stones (1954–56), fluorspar (1953, 1955), scrap mica (1954), monazite (1955–56), quartz (1953), stone (crushed limestone 1955), vanadium (1953–54), and values indicated by footnote 4 | | 3,878 | | [12] 6,308 | | [12] 7,002 | | [12] 6,885 |
| Total Idaho | | 67,063 | | 69,689 | | 68,513 | | 75,178 |
| **ILLINOIS** | | | | | | | | |
| Cement—thousand 376-pound barrels | 8,651 | 21,962 | 9,109 | 23,148 | 9,397 | 25,032 | 9,301 | 27,264 |
| Clays—thousand short tons | 2,305 | 4,573 | 2,027 | 3,482 | 2,339 | 3,979 | 2,258 | 4,005 |
| Coal—do | 46,010 | 181,598 | 41,971 | 160,213 | 45,932 | 167,938 | 48,102 | 184,678 |
| Fluorspar | 163,303 | 8,567 | 107,830 | 5,989 | 166,337 | 7,838 | 178,254 | 8,470 |
| Lead (recoverable content of ores, etc.) | 3,391 | 888 | 3,232 | 886 | 4,544 | 1,354 | 3,832 | 1,203 |
| Lime | 519,992 | 6,987 | 532,051 | 7,421 | 644,181 | 9,416 | [6] | [6] |
| Natural gas—million cubic feet | 9,282 | 1,559 | 9,475 | 1,345 | 8,033 | 1,036 | 6,177 | 933 |
| Peat | [4] | [6] | [6] | [6] | [6] | [6] | 14,451 | 158 |
| Petroleum (crude)—thousand 42-gallon barrels | 59,026 | 170,590 | 66,798 | 199,060 | 81,423 | 236,940 | 82,346 | 241,274 |
| Sand and gravel—thousand short tons | 21,522 | 20,540 | 24,443 | 26,164 | 26,362 | 28,139 | 31,239 | 33,254 |
| Sand and sandstone (ground) | 276,215 | 2,462 | [16] | [16] | [14] | [14] | [16] | [16] |
| Silver (recoverable content of ores, etc.)—troy ounces | 2,338 | 2 | 1,160 | 1 | 3,075 | 3 | 1,580 | 1 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | 22,939 | 29,737 | 26,407 | 31,134 | 28,866 | 35,621 | 31,855 | 40,359 |
| Zinc (recoverable content of ores, etc.) | 14,556 | 3,348 | 14,427 | 3,116 | 21,700 | 5,338 | 24,039 | 6,587 |
| Value of items that cannot be disclosed: Iron oxide pigments (1954), natural-gas liquids, recovered elemental sulfur, tripoli, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 9,630 | | 13,061 | | 12,666 | | 26,048 |
| Total Illinois | | 462,443 | | [7] 473,077 | | [7] 533,062 | | [7] 572,321 |
| **INDIANA** | | | | | | | | |
| Abrasive stones | [4] | [6] | [6] | [6] | [6] | [6] | 3 | 5 |
| Clays—thousand short tons | 1,654 | 2,514 | 1,946 | 2,991 | 1,729 | 2,938 | 2,051 | 3,457 |
| Coal—do | 15,812 | 62,354 | 13,400 | 48,913 | 16,149 | 58,000 | 17,089 | 64,061 |
| Lime | [4] | [6] | [6] | [6] | [6] | [6] | 80 | 1 |
| Marl, calcareous (except for cement) | 13,540 | 7 | 28,536 | 19 | 17,080 | 10 | 99,561 | 66 |
| Natural gas—million cubic feet | 701 | 49 | 735 | 44 | 1,226 | 152 | 791 | 96 |
| Peat | 6,919 | 41 | [6] | [6] | [6] | [6] | 11,383 | 79 |
| Petroleum (crude)—thousand 42-gallon barrels | 12,823 | 37,570 | 11,204 | 33,160 | 10,988 | 31,980 | 11,513 | 33,733 |
| Sand and gravel—thousand short tons | 11,203 | 9,501 | 14,405 | 11,879 | 17,062 | 14,306 | 16,667 | 14,353 |
| Stone (except limestone for cement and lime, 1953)—do | 9,213 | 22,297 | 11,182 | 27,460 | 14,124 | 34,680 | 14,700 | 31,575 |
| Value of items that cannot be disclosed: Cement, gypsum (1955–56), pyrites (1953), recovered elemental sulfur, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 35,448 | | 42,448 | | 43,888 | | 50,596 |
| Total Indiana | | 169,781 | | [7] 165,369 | | [7] 183,479 | | [7] 195,674 |

See footnotes at end of table.

Digitized by Google

## TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

### HAWAII

| Minera | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Clays thousand short tons | (4) | (4) | (4) | (4) | (4) | (4) | 2 | 2 |
| Lime | 7,431 | 224 | 8,375 | 251 | 6,453 | 202 | 9,555 | 306 |
| Pumice | | | (4) | (4) | 130,306 | 76 | 58,851 | 92 |
| Salt thousand short tons | (4) | (4) | (4) | (4) | (4) | (4) | (19) | 18 |
| Sand and gravel do | 111 | 157 | 119 | 319 | 165 | 426 | 193 | 503 |
| Stone do | [6] 1,300 | [6] 2,654 | 1,485 | 2,993 | 1,414 | 2,884 | 3,494 | 6,076 |
| Value of items that cannot be disclosed: Other nonmetals and values indicated by footnote 4 | | 297 | | 59 | | 22 | | |
| Total Hawaii | | 3,332 | | [13] 3,596 | | [13] 3,592 | | [13] 6,972 |

### IDAHO

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Antimony ore and concentrate antimony content | (4) | (4) | 764 | (4) | 633 | (4) | 549 | (4) |
| Beryllium concentrate gross weight | 1 | 1 | (4) | (4) | | | | |
| Clays thousand short tons | 26 | 21 | (4) | (4) | 35 | 30 | [5] 23 | [5] 13 |
| Cobalt (content of concentrate) pounds | 1,211,039 | (4) | 1,702,272 | (4) | 1,691,334 | (4) | 2,385,013 | (4) |
| Columbium-tantalum concentrate do | (4) | (4) | | | (4) | (4) | 215,900 | (4) |
| Copper (recoverable content of ores, etc.) | 3,136 | 1,800 | 4,828 | 2,848 | 5,618 | 4,191 | 6,656 | 5,658 |
| Gold (recoverable content of ores, etc.) troy ounces | 17,630 | 617 | 13,245 | 463 | 10,572 | 370 | 10,029 | 351 |
| Gypsum | 150 | (5) | (4) | (4) | (4) | (4) | | |
| Iron ore (usable) thousand long tons | | | | | | | 1 | (4) |
| Lead (recoverable content of ores, etc.) | 74,610 | 19,548 | 69,302 | 18,989 | 64,163 | 19,121 | 64,231 | 20,197 |
| Mercury 76-pound flasks | (4) | (4) | 609 | 161 | 1,107 | 321 | 3,394 | 882 |
| Mica, sheet pounds | 24,216 | 223 | (4) | (4) | (4) | (4) | | |
| Nickel (content of ore and concentrate) | 11 | (4) | 13 | (4) | 33 | (4) | 49 | (4) |
| Peat | | | 500 | (4) | (4) | (4) | | |
| Phosphate rock thousand long tons | 1,002 | 4,150 | 1,093 | 5,687 | 1,330 | 6,038 | 1,438 | 6,539 |
| Pumice | 85,224 | 160 | (4) | (4) | (4) | (4) | 101,913 | 206 |
| Sand and gravel thousand short tons | 3,776 | 2,841 | 6,718 | 4,569 | 8,652 | 3,934 | 7,874 | 5,661 |
| Sand and sandstone (ground) | 5,304 | 44 | (14) | (14) | (14) | (14) | (14) | (14) |
| Silver (recoverable content of ores, etc.) troy ounces | 14,639,740 | 13,250 | 15,867,414 | 14,361 | 13,831,458 | 12,518 | 13,471,916 | 12,193 |
| Stone (except limestone for cement, 1953) thousand short tons | 1,142 | 2,261 | 2,329 | 3,013 | 1,525 | 1,866 | 1,791 | 2,752 |
| Titanium concentrate gross weight | 1,585 | 8 | | | 1,330 | 7 | 48,619 | 261 |
| Tungsten concentrate 60-percent $WO_3$ basis | 441 | 1,666 | 471 | (4) | 642 | (4) | 582 | (4) |
| Zinc (recoverable content of ores, etc.) | 72,153 | 16,595 | 61,528 | 13,290 | 53,314 | 13,115 | 49,561 | 13,530 |

Digitized by Google

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Value of items that cannot be disclosed: Barite, cement, fire clay (1956), abrasive garnet, gem stones (1954–56), fluorspar (1953, 1955), scrap mica (1954), monazite (1955–56), quartz (1953), stone (crushed limestone 1955), vanadium (1953–54), and values indicated by footnote 4 | | 3,878 | | [12] 6,308 | | [12] 7,002 | | [12] 6,835 |
| Total Idaho | | 67,063 | | 69,689 | | 68,613 | | 75,178 |
| **ILLINOIS** | | | | | | | | |
| Cement—thousand 376-pound barrels | 8,651 | 21,962 | 9,109 | 23,148 | 9,397 | 25,032 | 9,301 | 27,264 |
| Clays—thousand short tons | 2,305 | 4,573 | 2,027 | 3,482 | 2,339 | 3,979 | 2,258 | 4,005 |
| Coal—do | 46,010 | 181,598 | 41,971 | 160,213 | 45,932 | 167,938 | 48,102 | 184,678 |
| Fluorspar | 163,303 | 8,567 | 107,830 | 5,989 | 166,337 | 7,838 | 178,254 | 8,470 |
| Lead (recoverable content of ores, etc.) | 3,391 | 888 | 3,232 | 886 | 4,544 | 1,354 | 3,832 | 1,203 |
| Lime | 519,992 | 6,987 | 532,051 | 7,421 | 644,181 | 9,416 | (4) | (4) |
| Natural gas—million cubic feet | 9,282 | 1,559 | 9,475 | 1,345 | 8,033 | 1,036 | 6,177 | 933 |
| Peat | (4) | (4) | (4) | (4) | (4) | (4) | 14,451 | 158 |
| Petroleum (crude)—thousand 42-gallon barrels | 59,026 | 170,590 | 66,798 | 199,060 | 81,423 | 236,940 | 82,346 | 241,274 |
| Sand and gravel—thousand short tons | 21,522 | 20,540 | 24,443 | 26,164 | 26,362 | 28,139 | 31,239 | 33,254 |
| Sand and sandstone (ground) | 276,215 | 2,462 | (14) | (14) | (14) | (14) | (14) | (14) |
| Silver (recoverable content of ores, etc.)—troy ounces | 2,338 | 2 | 1,160 | 1 | 3,075 | 3 | 1,580 | 1 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | 22,939 | 29,737 | 26,407 | 31,134 | 28,866 | 35,621 | 31,855 | 40,859 |
| Zinc (recoverable content of ores, etc.) | 14,556 | 3,348 | 14,427 | 3,116 | 21,700 | 5,338 | 24,039 | 6,587 |
| Value of items that cannot be disclosed: Iron oxide pigments (1954), natural-gas liquids, recovered elemental sulfur, tripoli, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 9,630 | | 13,061 | | 12,666 | | 26,048 |
| Total Illinois | | 462,443 | | [7] 473,077 | | [7] 533,062 | | [7] 572,321 |
| **INDIANA** | | | | | | | | |
| Abrasive stones | (4) | (4) | (4) | (4) | (4) | (4) | 3 | 5 |
| Clays—thousand short tons | 1,554 | 2,514 | 1,946 | 2,991 | 1,729 | 2,938 | 2,051 | 3,457 |
| Coal—do | 15,812 | 62,354 | 13,400 | 48,913 | 16,149 | 58,000 | 17,089 | 64,061 |
| Lime | (4) | (4) | (4) | (4) | (4) | (4) | 80 | 1 |
| Marl, calcareous (except for cement) | 13,540 | 7 | 28,536 | 19 | 17,080 | 10 | 99,561 | 66 |
| Natural gas—million cubic feet | 701 | 49 | 735 | 44 | 1,226 | 152 | 791 | 96 |
| Peat | 6,919 | 41 | (4) | (4) | (4) | (4) | 11,383 | 79 |
| Petroleum (crude)—thousand 42-gallon barrels | 12,823 | 37,570 | 11,204 | 33,160 | 10,988 | 31,980 | 11,513 | 33,733 |
| Sand and gravel—thousand short tons | 11,203 | 9,501 | 14,405 | 11,879 | 17,062 | 14,306 | 16,667 | 14,353 |
| Stone (except limestone for cement and lime, 1953)—do | 9,213 | 22,297 | 11,182 | 27,460 | 14,124 | 34,680 | 14,700 | 31,575 |
| Value of items that cannot be disclosed: Cement, gypsum (1955–56), pyrites (1953), recovered elemental sulfur, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 35,448 | | 42,448 | | 43,888 | | 50,598 |
| Total Indiana | | 169,781 | | [7] 165,369 | | [7] 183,479 | | [7] 195,674 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued**

**IOWA**

| Minera | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Cement.....thousand 376-pound barrels.. | 9,111 | 23,330 | 9,859 | 27,044 | 10,430 | 29,539 | 10,760 | 32,823 |
| Clays.....thousand short tons.. | 913 | 975 | 883 | 921 | (4) | (4) | [5] 852 | [5] 1,078 |
| Coal.....do.... | 1,388 | 5,262 | 1,197 | 4,503 | 1,258 | 4,402 | 1,358 | 4,732 |
| Gypsum..... | 1,151,692 | 2,940 | 1,106,626 | 3,036 | 1,337,160 | 4,177 | 1,177,488 | 3,919 |
| Lead (recoverable content of ores, etc.)..... | | | 4 | 1 | | | | |
| Peat..... | 17,233 | (4) | (4) | (4) | (4) | (4) | 27,375 | (4) |
| Sand and gravel.....thousand short tons.. | 10,385 | 6,401 | 12,200 | 9,276 | 11,771 | 8,345 | 12,895 | 9,525 |
| Stone (except limestone for cement 1953).....do.... | 10,715 | 13,215 | 13,240 | 16,388 | 15,705 | 18,555 | 14,035 | 17,256 |
| Value of items that cannot be disclosed: Nonmetals and minerals indicated by footnote 4..... | | 224 | | 251 | | 1,252 | | 467 |
| Total Iowa..... | | [10] 51,994 | | [7] 58,798 | | [7] 63,555 | | [7] 66,529 |

**KANSAS**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cement [16].....thousand 376-pound barrels.. | 8,546 | 21,428 | 9,076 | 23,874 | 9,454 | 25,854 | 10,598 | 30,696 |
| Clays.....thousand short tons.. | 671 | 750 | (4) | (4) | [5] 768 | [5] 873 | 977 | 1,169 |
| Coal.....do.... | 1,715 | 7,101 | 1,372 | 5,603 | 742 | 3,166 | 884 | 3,856 |
| Helium.....thousand cubic feet.. | 42,783 | 564 | 37,530 | 593 | 42,750 | 663 | 45,035 | 698 |
| Lead (recoverable content of ores, etc.)..... | 3,347 | 877 | 4,033 | 1,105 | 5,498 | 1,638 | 7,635 | 2,398 |
| Natural gas.....million cubic feet.. | 420,607 | 36,172 | 412,369 | 43,711 | 471,041 | 52,286 | 526,091 | 59,448 |
| Natural-gas liquids: | | | | | | | | |
| Natural gasoline.....thousand gallons.. | (4) | (4) | (4) | (4) | 118,599 | 6,318 | 105,482 | 5,928 |
| LP-gases.....do.... | (4) | (4) | (4) | (4) | 92,596 | 2,643 | 90,287 | 3,843 |
| Petroleum (crude).....thousand 42-gallon barrels.. | 114,566 | 308,180 | 119,317 | 335,280 | 121,669 | 340,670 | 124,204 | 346,529 |
| Pumice..... | (4) | (4) | 23,433 | 93 | 2,320 | 60 | (4) | (4) |
| Salt (common).....thousand short tons.. | 905 | 7,481 | 877 | 7,779 | 911 | 8,432 | 1,004 | 9,168 |
| Sand and gravel.....do.... | 8,728 | 5,668 | 10,422 | 7,194 | 10,665 | 6,910 | 12,515 | 8,022 |
| Stone (except limestone for cement, 1953).....do.... | 8,769 | 11,304 | 10,377 | 12,942 | 12,483 | 15,946 | 13,434 | 15,703 |
| Zinc (recoverable content of ores, etc.)..... | 15,515 | 3,568 | 19,110 | 4,128 | 27,611 | 6,792 | 28,665 | 7,854 |
| Value of items that cannot be disclosed: Natural cement, fire clay (1955), gypsum, and values indicated by footnote 4. Excludes value of clays used for cement (1953)..... | | 10,138 | | 9,721 | | 1,616 | | 1,465 |
| Total Kansas..... | | 413,231 | | [7] 449,587 | | [7] 470,830 | | [7] 493,307 |

Digitized by Google

## KENTUCKY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 711 | 3,118 | 571 | 2,995 | 876, | 4,416 | 905 | 4,079 |
| Coal | do | 65,060 | 302,872 | 56,964 | 236,737 | 69,020 | 288,665 | 74,555 | 331,358 |
| Fluorspar | | 47,244 | 2,101 | 35,831 | 1,510 | 8,899 | 308 | 14,865 | 608 |
| Lead (recoverable content of ores, etc.) | | 52 | 14 | 80 | 22 | | | 228 | 72 |
| Natural gas | million cubic feet | 71,405 | 15,638 | 72,713 | 16,579 | 73,214 | 17,352 | 73,687 | 17,022 |
| Natural-gas liquids: | | | | | | | | | |
| Natural gasoline | thousand gallons | 35,406 | 2,394 | 28,224 | 1,552 | 34,991 | 2,492 | 35,275 | 2,414 |
| LP-gases | do | 176,232 | 4,993 | 189,966 | 5,066 | 189,247 | 6,451 | 248,992 | 8,709 |
| Petroleum (crude) | thousand 42-gallon barrels | 11,518 | 33,520 | 13,791 | 40,270 | 15,518 | 44,850 | 17,628 | 51,297 |
| Sand and gravel | thousand short tons | 3,052 | 2,900 | 4,730 | 4,402 | 4,899 | 5,298 | 5,684 | 5,974 |
| Silver (recoverable content of ores, etc.) | troy ounces | | | | | | | 31 | (5) |
| Stone (except limestone for cement, 1953) | | [6] 7,430 | [6] 9,268 | 10,130 | 13,286 | 11,934 | 15,579 | 11,553 | 15,324 |
| Zinc (recoverable content of ores, etc.) | | 489 | 112 | 458 | 99 | | | 417 | 114 |
| Value of items that cannot be disclosed: Native asphalt, cement, iron ore (1956), stone (dimension sandstone, 1953). Excludes value of clays used for cement (1953) | | | 4,812 | | 5,626 | | 6,446 | | 7,079 |
| Total Kentucky | | | 381,742 | | [7] 327,503 | | [7] 391,068 | | [7] 443,168 |

## LOUISIANA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Clays** | thousand short tons | 624 | 952 | [8] 714 | [8] 941 | [8] 651 | [8] 659 | [8] 785 | [8] 785 |
| **Gypsum** | | (4) | (4) | (4) | (4) | 335,371 | 587 | 275,984 | 598 |
| **Natural gas** | million cubic feet | 1,293,644 | 106,079 | 1,399,222 | 124,531 | 1,680,032 | 189,844 | 1,896,302 | 215,038 |
| **Natural-gas liquids:** | | | | | | | | | |
| Natural gasoline and cycle products | thousand gallons | 665,532 | 55,421 | 665,070 | 54,330 | 782,328 | 59,158 | 773,949 | 62,394 |
| LP-gases | do | 287,280 | 12,654 | 292,226 | 11,620 | 291,138 | 10,323 | 305,222 | 14,727 |
| **Petroleum (crude)** | thousand 42-gallon barrels | 256,632 | 721,150 | 246,558 | 722,370 | 271,010 | 793,280 | 299,421 | 877,951 |
| **Salt (common)** | thousand short tons | 3,061 | 9,189 | 3,089 | 11,101 | 3,563 | 15,407 | 3,704 | 17,695 |
| **Sand and gravel** | do | 4,538 | 5,162 | 7,910 | 9,687 | 8,574 | 10,942 | 9,832 | 12,158 |
| **Stone (except limestone for cement and lime, 1953)** | thousand short tons | | | 2,044 | 3,127 | 3,253 | 4,961 | 4,405 | 6,674 |
| **Sulfur (Frasch-process)** | long tons | 1,609,364 | 43,453 | 1,853,563 | 49,222 | 2,072,418 | 58,028 | 2,238,852 | 59,330 |
| **Value of items that cannot be disclosed: Cement, bentonite (1954–56), lime, recovered elemental sulfur, and values indicated by footnote 4. Excludes clays used for cement (1953)** | | | 11,177 | | 13,334 | | 15,309 | | 16,563 |
| Total Louisiana | | | 965,237 | | [12] 998,057 | | [12] 1,156,637 | | [12] 1,281,849 |

**See footnotes at end of table.**

Digitized by Google

## TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

### MAINE

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Beryllium concentrate—gross weight | (4) | (4) | (4) | (4) | 22 | 13 | 12 | 7 |
| Cement—thousand 376-pound barrels | 2,001 | 5,422 | 1,973 | 5,425 | 2,349 | 6,875 | (4) | (4) |
| Clays—thousand short tons | 30 | 28 | 27 | 27 | 33 | 33 | 26 | 23 |
| Feldspar—long tons | 17,637 | 117 | (4) | (4) | 26,282 | 189 | 22,219 | 144 |
| Gem stones | | | (5) | (4) | (5) | 5 | (5) | 1 |
| Lime | (4) | (4) | (4) | (4) | (4) | (4) | 11,997 | 179 |
| Mica: Scrap | (4) | (4) | (4) | (4) | 71 | 2 | 114 | 3 |
| Sheet—pounds | (4) | (4) | 10,320 | 37 | 21,121 | 129 | 19,913 | 146 |
| Peat | 2,428 | 74 | (4) | (4) | (4) | (4) | (4) | (4) |
| Sand and gravel—thousand short tons | 8,072 | 2,608 | 7,461 | 2,538 | 7,529 | 2,855 | 7,196 | 3,085 |
| Stone (except limestone for cement and lime, 1953)—do | [6] 249 | [6] 1,215 | 1,024 | 2,356 | 1,192 | 2,542 | 942 | 2,238 |
| Value of items that cannot be disclosed: Columbium-tantalum concentrate, quartz from pegmatites or quartzite (1953), slate, stone (crushed limestone, 1953), and values indicated by footnote 4 | | 1,039 | | 865 | | 857 | | 6,912 |
| Total Maine | | 10,503 | | [13] 10,716 | | [13] 12,991 | | [13] 12,179 |

### MARYLAND

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays—thousand short tons | 671 | 1,136 | 627 | 1,166 | 698 | 1,265 | [6] 636 | [6] 1,046 |
| Coal—do | 531 | 2,442 | 422 | 1,879 | 512 | 2,002 | 669 | 2,685 |
| Lime | 71,705 | 708 | 67,081 | 685 | 74,497 | 669 | 52,604 | 581 |
| Natural gas—million cubic feet | 1,408 | 268 | 1,394 | 282 | 3,116 | 626 | 4,619 | 1,169 |
| Sand and gravel—thousand short tons | 7,380 | 8,919 | 10,098 | 12,171 | 9,695 | 12,211 | [17] 10,147 | [17] 12,895 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | [6] 3,578 | [6] 6,275 | 5,065 | 8,266 | [6] 5,343 | [6] 8,800 | 6,229 | 13,305 |
| Value of items that cannot be disclosed: Beryllium concentrate (1954), cement, ball clay, (1956), gem stones (1956), greensand marl (1954–56), mica (1954), potassium salts, slate (1953–55), stone (dimension limestone and crushed marble 1953, oystershell 1955), and talc and soapstone. Excludes value of clays used for cement (1953) | | 7,337 | | 7,289 | | 11,028 | | 10,727 |
| Total Maryland | | 27,085 | | [7] 30,743 | | [7] 35,491 | | [7] 40,532 |

Digitized by Google

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **MASSACHUSETTS** | | | | | | | | |
| Clays | thousand short tons | 152 | 196 | 129 | 121 | 125 | 142 | 128 | 213 |
| Lime | | 135,383 | 2,156 | 127,836 | 1,709 | 134,952 | 1,957 | 134,248 | 2,093 |
| Peat | | 2,061 | 16 | (4) | (4) | (4) | | 300 | (4) |
| Sand and gravel | thousand short tons | 7,308 | 5,931 | 9,640 | 8,366 | 9,581 | 8,926 | 10,189 | 9,520 |
| Stone (except limestone for lime, 1953) | do | 3,458 | 8,821 | 2,942 | 9,040 | 4,128 | 11,381 | 5,442 | 13,753 |
| Value of items that cannot be disclosed: Mineral fuels and nonmetals | | | 71 | | 12 | | 6 | | 3 |
| Total Massachusetts | | | 17,191 | | [13] 18,851 | | [13] 22,109 | | [13] 25,085 |
| **MICHIGAN** | | | | | | | | | |
| Cement | thousand 376-pound barrels | 15,853 | 41,860 | 16,712 | 45,692 | 19,738 | 58,048 | 21,880 | 67,708 |
| Clays | thousand short tons | 1,646 | 1,686 | 1,871 | 1,919 | 1,938 | 2,019 | 2,110 | 2,401 |
| Copper (recoverable content of ores, etc.) | | 24,097 | 13,832 | 23,593 | 13,920 | 50,066 | 37,349 | 61,526 | 52,297 |
| Gypsum | | 1,446,973 | 4,091 | 1,693,279 | 5,036 | 1,762,105 | 5,661 | 1,715,832 | 5,861 |
| Iron ore (usable) | thousand long tons, gross weight | 13,313 | 94,692 | 9,709 | 70,004 | 14,144 | 104,258 | 12,536 | 98,111 |
| Magnesium compounds from well brines (partly estimated) MgO equivalent | | 43,190 | 4,592 | 37,038 | 4,104 | 46,336 | 5,064 | (4) | (4) |
| Manganiferous ore (5 to 35 percent Mn) | gross weight | 76,251 | (4) | 15,361 | (4) | | | | |
| Marl, calcareous (except for cement) | | 183,685 | 73 | 106,668 | 38 | 119,313 | 57 | 157,246 | 95 |
| Natural gas | million cubic feet | 7,774 | 1,275 | 6,962 | 1,239 | 8,300 | 955 | 10,911 | 1,451 |
| Peat | | 25,439 | 257 | (4) | (4) | (4) | (4) | 31,111 | 475 |
| Petroleum (crude) | thousand 42-gallon barrels | 12,285 | 35,870 | 12,028 | 35,600 | 11,266 | 32,900 | 10,740 | 30,824 |
| Salt (common) | thousand short tons | 5,127 | 22,172 | 5,064 | 29,397 | 4,975 | 31,668 | 5,548 | 35,644 |
| Sand and gravel | do | 30,460 | 23,171 | 32,041 | 25,516 | 37,214 | 29,491 | 42,150 | 35,146 |
| Silver (recoverable content of ores, etc.) | troy ounces | | | | | 478,000 | 433 | 379,990 | 344 |
| Stone (except limestone for cement and lime, 1953) | thousand short tons | 21,616 | 17,639 | 27,758 | 21,904 | 33,636 | 28,909 | 33,999 | 31,010 |
| Value of items that cannot be disclosed: Bromine, calcium-magnesium chloride, gem stones (1955–56), lime, magnesium chloride for metal (1953–55), natural-gas liquids, potassium salts, ground sand and sandstone (1953), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 25,277 | | 29,272 | | 31,850 | | 38,717 |
| Total Michigan | | | 286,487 | | [7] 279,940 | | [7] 363,787 | | [7] 394,536 |
| **MINNESOTA** | | | | | | | | | |
| Clays | thousand short tons | 91 | 149 | (4) | (4) | (4) | (4) | [8] 80 | [8] 91 |
| Iron ore (usable) | thousand long tons, gross weight | 80,534 | 517,851 | 48,613 | 319,633 | 69,419 | 465,170 | 62,637 | 461,904 |
| Manganiferous ore (5 to 35 percent Mn) | gross weight | 1,091,491 | (4) | 504,057 | (4) | 864,628 | (4) | 633,919 | (4) |
| Marl, calcareous (except for cement) | | (4) | (4) | (4) | (4) | (4) | (4) | 875 | (4) |
| Sand and gravel | thousand short tons | 19,774 | 7,304 | 23,849 | 16,319 | 25,896 | 17,429 | 28,197 | 18,254 |
| Stone (except limestone for cement and lime, 1953) | do | 2,271 | 6,587 | [8] 2,629 | [8] 7,485 | [8] 3,005 | [8] 7,043 | [8] 3,084 | [8] 7,552 |
| Value of items that cannot be disclosed: Abrasive stones, cement, fire clay (1956), gem stones (1955–56), lime, manganese ore (1955–56), peat (1954–56), stone, crushed sandstone, 1954–56), and values indicated by footnote 4 | | | 10,654 | | 8,204 | | 11,739 | | 13,443 |
| Total Minnesota | | | 542,545 | | [13] 351,474 | | [13] 501,151 | | [13] 501,027 |

**See footnotes at end of table.**

465877—58—3

Digitized by Google

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

MISSISSIPPI

| Mineral | | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Clays | thousand short tons | 560 | 3,158 | 559 | 3,103 | 701 | 3,913 | 613 | 3,590 |
| Natural gas | million cubic feet | 154,254 | 12,340 | 140,448 | 11,657 | 163,167 | 15,664 | 185,137 | 18,143 |
| Natural-gas liquids: | | | | | | | | | |
| Natural gasoline and cycle products | thousand gallons | 32,214 | 2,295 | 27,804 | 1,944 | 22,382 | 1,573 | 24,829 | 1,751 |
| LP-gases | do | 17,724 | 713 | 15,288 | 528 | 12,242 | 396 | 10,698 | 580 |
| Petroleum (crude) | thousand 42-gallon barrels | 35,620 | 84,060 | 34,240 | 85,600 | 37,741 | 92,840 | 40,824 | 100,019 |
| Sand and gravel | thousand short tons | 2,654 | 2,174 | 5,442 | 4,287 | 5,625 | 4,603 | 5,315 | 4,701 |
| Stone | do | 38 | 44 | 181 | 181 | 573 | 573 | 656 | 656 |
| Value of items that cannot be disclosed: Certain metals and nonmetals. Excludes value of clays used for cement (1953) | | | 3,084 | | 3,353 | | 3,590 | | 4,174 |
| Total Mississippi | | | 107,868 | | [13] 110,563 | | [13] 122,620 | | [13] 133,098 |

MISSOURI

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Barite | | 330,763 | 3,338 | 312,791 | 3,047 | 363,692 | 4,004 | 381,642 | 4,462 |
| Cement | thousand 376-pound barrels | 9,860 | 26,238 | 11,379 | 31,425 | [13] 12,255 | [13] 34,912 | [13] 12,012 | [13] 36,888 |
| Clays | thousand short tons | 2,232 | 11,182 | 1,927 | 5,859 | 2,402 | 6,902 | 2,658 | 8,016 |
| Coal | do | 2,393 | 9,849 | 2,514 | 10,028 | 3,232 | 12,772 | 3,283 | 13,223 |
| Copper (recoverable content of ores, etc.) | | 2,374 | 1,363 | 1,925 | 1,136 | 1,722 | 1,285 | 1,890 | 1,606 |
| Iron ore (usable) thousand long tons, gross weight | | 275 | (4) | 173 | (4) | 261 | (4) | (4) | (4) |
| Lead (recoverable content of ores, etc.) | | 125,895 | 32,984 | 125,250 | 34,319 | 125,412 | 37,373 | 123,783 | 38,868 |
| Lime | | 1,212,107 | 12,084 | 1,125,919 | 11,165 | 1,464,828 | 14,408 | 1,481,611 | 15,814 |
| Natural gas | million cubic feet | 15 | 3 | 16 | (4) | 15 | 3 | 12 | 2 |
| Petroleum (crude) | thousand 42-gallon barrels | 39 | (4) | (4) | (4) | 72 | 190 | 65 | 176 |
| Sand and gravel | thousand short tons | 5,792 | 5,234 | 9,891 | 10,204 | 9,984 | 9,981 | 9,585 | 10,117 |
| Silver (recoverable content of ores, etc.) | troy ounces | 359,781 | 326 | 352,971 | 320 | 268,620 | 243 | 295,111 | 267 |
| Stone (except limestone for cement and lime, 1953) | thousand short tons | [6] 13,948 | [6] 20,553 | 18,672 | 24,752 | [6] 22,369 | [6] 29,580 | 24,578 | 33,577 |
| Zinc (recoverable content of ores, etc.) | | 9,981 | 2,296 | 5,210 | 1,125 | 4,476 | 1,101 | 4,380 | 1,200 |
| Value of items that cannot be disclosed: Native asphalt, masonry cement (1955–56), cobalt (1955–56), iron oxide pigment materials (1955–56), manganese ore (1953–54), nickel (1955–56), ground sand and sandstone (1953), stone (dimension marble 1953, 1955), tripoli (1953–54), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 2,757 | | 2,908 | | 4,833 | | 5,897 |
| Total Missouri | | | 128,207 | | [7] 131,280 | | [7] 151,626 | | [7] 163,603 |

Digitized by Google

## MONTANA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Chromite | gross weight | 26,089 | 870 | 123,096 | 4,133 | 118,703 | 3,719 | 118,780 | 3,807 |
| Clays | thousand short tons | 37 | 38 | (4) | (4) | (4) | (4) | [5] 33 | [5] 31 |
| Coal: | | | | | | | | | |
| Bituminous | do | 1,848 | 4,884 | 1,491 | 4,157 | 1,247 | 3,782 | 846 | 3,468 |
| Lignite | do | 25 | 93 | | | | | | |
| Copper (recoverable content of ores, etc.) | | 77,617 | 44,552 | 59,349 | 35,016 | 81,542 | 60,830 | 96,426 | 81,962 |
| Fluorspar | | 5,932 | (4) | 15,102 | (4) | 25,223 | (4) | 59,775 | (4) |
| Gem stones | | | | (9) | (4) | (9) | (4) | (9) | 35 |
| Gold (recoverable content of ores, etc.) | troy ounces | 24,768 | 867 | 23,660 | 828 | 28,123 | 984 | 38,121 | 1,334 |
| Iron ore (usable) | thousand long tons, gross weight | 7 | 45 | 6 | (4) | 7 | (4) | 12 | (4) |
| Lead (recoverable content of ores, etc.) | | 19,949 | 5,227 | 14,820 | 4,061 | 17,028 | 5,075 | 18,642 | 5,853 |
| Manganese ore (35 percent or more Mn) | gross weight | 113,429 | (4) | 58,661 | (4) | 106,026 | (4) | 80,552 | (4) |
| Manganiferous ore (5 to 35 percent Mn) | do | 5,598 | (4) | 5,266 | (4) | 6,341 | (4) | 4,752 | (4) |
| Mica, sheet | pounds | | | (4) | (4) | | | 56 | 1 |
| Natural gas | million cubic feet | 27,889 | 1,645 | 30,252 | 2,057 | 28,255 | 1,724 | 25,847 | 1,758 |
| Petroleum (crude) | thousand 42-gallon barrels | 11,920 | 26,020 | 14,195 | 31,230 | 15,654 | 35,380 | 21,760 | 56,141 |
| Phosphate rock | thousand long tons | (4) | (4) | (4) | (4) | (4) | (4) | 558 | 3,957 |
| Pumice | | 3,000 | 15 | 175 | 1 | (4) | (4) | (4) | (8) |
| Sand and gravel | thousand short tons | 6,203 | 2,994 | 13,341 | 7,460 | 13,772 | 6,615 | 10,024 | 7,174 |
| Silver (recoverable content of ores, etc.) | troy ounces | 6,689,556 | 6,054 | 5,177,942 | 4,686 | 6,080,390 | 5,503 | 7,385,908 | 6,685 |
| Stone (except limestone for cement and lime, 1953) | thousand short tons | [6] 803 | [6] 1,125 | 1,320 | 1,385 | 1,274 | 1,200 | 1,247 | 1,816 |
| Talc | | (4) | (4) | (4) | (4) | (4) | (4) | 22,197 | 210 |
| Tungsten ore and concentrate | 60-percent $WO_3$ basis | 14 | (4) | 678 | (4) | 1,211 | (4) | 1,230 | (4) |
| Zinc (recoverable content of ores, etc.) | | 80,271 | 18,462 | 60,952 | 13,166 | 68,588 | 16,873 | 70,520 | 19,322 |
| Value of items that cannot be disclosed: Antimony ore and concentrate (1953), barite, cement, clay (bentonite 1956), gypsum, lime, natural-gas liquids, pyrites, stone (dimension granite 1953), recovered elemental sulfur (1956), vermiculite, and values indicated by footnote 4 | | | 19,293 | | 18,519 | | 25,637 | | 21,080 |
| Total Montana | | | 132,184 | | [13] 126,412 | | [13] 166,993 | | [13] 213,728 |

## NEBRASKA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 176 | 187 | 164 | 164 | 151 | 151 | 153 | 154 |
| Gem stones | | | | | | (9) | 2 | (9) | 3 |
| Natural gas | million cubic feet | 6,748 | 911 | 6,801 | 706 | 12,515 | 2,553 | 13,541 | 2,844 |
| Petroleum (crude) | thousand 42-gallon barrels | 6,344 | 17,190 | 7,783 | 21,400 | 11,203 | 30,810 | 16,204 | 45,209 |
| Sand and gravel | thousand short tons | 5,970 | 4,340 | 8,548 | 6,992 | 8,405 | 6,193 | 10,350 | 7,404 |
| Stone (except limestone for cement, 1953) | do | 1,407 | 2,070 | 2,660 | 3,512 | 3,081 | 4,177 | 3,063 | 4,142 |
| Value of items that cannot be disclosed: Cement, natural-gas liquids, and pumice. Excludes value of clays used for cement (1953) | | | 8,583 | | 10,637 | | 11,144 | | 12,772 |
| Total Nebraska | | | 33,281 | | [7] 42,393 | | [7] 54,237 | | [7] 71,776 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued**

**NEVADA**

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Antimony ore and concentrate—antimony content | 20 | (4) | 4 | (4) | | | 13 | (4) |
| Barite | 99, 525 | 615 | 83, 833 | 517 | 113, 694 | 709 | 178, 440 | 1, 067 |
| Clays—thousand short tons | (4) | (4) | 5 | 9 | 6 | 13 | 14 | 32 |
| Copper (recoverable content of ores, etc.) | 61, 850 | 35, 502 | 70, 217 | 41, 428 | 78, 925 | 58, 878 | 82, 883 | 70, 450 |
| Fluorspar | (4) | (4) | (4) | (4) | (4) | (4) | 15, 646 | (4) |
| Gem stones | (5) | (4) | (5) | (4) | (5) | (4) | (5) | 50 |
| Gold (recoverable content of ores, etc.)—troy ounces | 101, 799 | 3, 563 | 79, 067 | 2, 767 | 72, 913 | 2, 552 | 72, 646 | 2, 543 |
| Gypsum | 701, 584 | 1, 975 | 654, 422 | 2, 217 | 836, 744 | 2, 836 | 790, 356 | 2, 701 |
| Iron ore (usable)—thousand long tons, gross weight | 444 | 2, 648 | 351 | 2, 025 | 325 | 1, 667 | 917 | 2, 498 |
| Lead (recoverable content of ores, etc.) | 4, 371 | 1, 145 | 3, 041 | 833 | 3, 291 | 981 | 6, 384 | 2, 004 |
| Manganese ore (35 percent or more Mn)—gross weight | 20, 150 | 1, 685 | (4) | (4) | 101, 469 | (4) | 121, 482 | (4) |
| Manganiferous ore (5 to 35 percent Mn)—do | 25, 064 | 432 | 12, 870 | 165 | | | | |
| Mercury—76-pound flasks | 3, 254 | 628 | 4, 974 | 1, 315 | 5, 750 | 1, 669 | 5, 859 | 1, 523 |
| Petroleum—thousand 42-gallon barrels | | | 33 | 40 | 64 | 110 | 64 | 111 |
| Pumice | 21, 269 | 86 | (4) | (4) | (4) | (4) | 11, 534 | 34 |
| Sand and gravel—thousand short tons | 2, 266 | 2, 089 | 3, 531 | 2, 957 | 3, 580 | 3, 762 | 4, 687 | 4, 569 |
| Silver (recoverable content of ores, etc.)—troy ounces | 697, 086 | 631 | 560, 182 | 507 | 845, 397 | 765 | 1, 220, 473 | 1, 105 |
| Stone (except limestone for lime, 1953)—thousand short tons | 1, 036 | 1, 399 | 1, 833 | 2, 011 | 1, 612 | 2, 609 | 1, 401 | 2, 281 |
| Talc and soapstone | 10, 906 | 73 | 5, 866 | 54 | 10, 732 | [17] 79 | 10, 540 | 98 |
| Tungsten concentrate—60-percent $WO_3$ basis | 3, 683 | 13, 824 | 5, 331 | 20, 048 | 6, 155 | 22, 751 | 5, 400 | 19, 263 |
| Zinc (recoverable content of ores, etc.) | 5, 812 | 1, 337 | 1, 035 | 224 | 2, 670 | 657 | 7, 488 | 2, 052 |
| Value of items that cannot be disclosed: Brucite (1953–54, 1956), diatomite, lime, magnesite, calcareous marl, molybdenum, perlite, salt, sulfur ore (1953, 1955–56), uranium (1956), and values indicated by footnote 4 | | 5, 891 | | 12, 435 | | 13, 752 | | 14, 404 |
| Total Nevada | | 73, 523 | | [13] 89, 138 | | [11 13] 113, 220 | | [13] 126, 233 |

**NEW HAMPSHIRE**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Beryllium concentrate—gross weight | 57 | 33 | 12 | 7 | 20 | 12 | (4) | (4) |
| Clays—thousand short tons | 45 | 41 | 36 | 36 | 35 | 35 | 36 | 47 |
| Columbium-tantalum concentrate—pounds | 770 | 1 | 255 | (5) | (5) | (5) | | |
| Feldspar—long tons | 28, 961 | 286 | (4) | (4) | (4) | (4) | (4) | (4) |
| Gem stones | | | | | (5) | 5 | (5) | 1 |

Digitized by Google

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mica: | | | | | | | | |
| Sheet pounds | 90,716 | 383 | 42,466 | 234 | (4) | (4) | 50,873 | 178 |
| Scrap | (4) | (4) | 325 | 12 | (4) | (4) | 305 | 10 |
| Peat | (4) | (4) | (4) | (4) | (4) | (4) | 320 | (4) |
| Sand and gravel thousand short tons | 2,249 | 506 | 2,241 | 1,095 | 2,432 | 1,593 | 3,862 | 1,822 |
| Stone do | 77 | 539 | 72 | 473 | (4) | (4) | (4) | (4) |
| Value of items that cannot be disclosed: Abrasive stones, and values indicated by footnote 4 | | 16 | | 255 | | 960 | | 1,378 |
| Total New Hampshire | | 1,805 | | 2,112 | | 2,605 | | 3,436 |
| **NEW JERSEY** | | | | | | | | |
| Clays thousand short tons | 532 | 1,326 | 578 | 1,246 | 644 | 1,562 | 651 | 2,214 |
| Iron ore (usable) thousand long tons, gross weight | 816 | 10,115 | 476 | 6,622 | 760 | 13,633 | 912 | 16,842 |
| Manganiferous residuum gross weight | 293,758 | (4) | 214,931 | (4) | 213,370 | (4) | 130,129 | (4) |
| Marl (greensand) | 6,821 | 193 | 2,101 | 185 | (4) | (4) | (4) | (4) |
| Peat | 21,706 | (4) | (4) | (4) | (4) | (4) | (4) | (4) |
| Sand and gravel thousand short tons | 7,362 | 10,836 | 10,005 | 14,705 | 11,153 | 16,425 | 11,194 | 18,239 |
| Sand and sandstone (ground) | 127,921 | 919 | (14) | (14) | (14) | (14) | (14) | (14) |
| Stone (except limestone for lime, 1953) thousand short tons | 6,036 | 13,308 | 5,772 | 12,110 | [6] 8,358 | [6] 17,528 | 9,012 | 20,825 |
| Sulfur, recovered elemental long tons | (4) | (4) | (4) | (4) | 7,404 | 244 | 8,972 | 291 |
| Zinc (recoverable content of ores, etc.) [10] | 45,700 | 9,923 | 37,416 | 7,992 | 11,643 | 2,864 | 4,667 | 1,260 |
| Value of items that cannot be disclosed: Ball clay (1956), gem stones (1955-56), lime, magnesium compounds, stone (crushed marble 1955), and values indicated by footnote 4 | | 5,325 | | [13] 4,184 | | [13] 5,239 | | [13] 4,608 |
| Total New Jersey | | 51,945 | | 47,044 | | 57,495 | | 64,279 |
| **NEW MEXICO** | | | | | | | | |
| Barite | (4) | (4) | (4) | (4) | (4) | (4) | 4,059 | 81 |
| Beryllium concentrate gross weight | 89 | 52 | 117 | 44 | 106 | 56 | 31 | (4) |
| Clays thousand short tons | 49 | 104 | 48 | 83 | 45 | 109 | 40 | 95 |
| Coal do | 514 | 3,081 | 123 | 727 | 202 | 1,236 | 158 | 923 |
| Columbium-tantalum concentrate pounds | (4) | (4) | 2,093 | 4 | 76 | (4) | 95 | (4) |
| Copper (recoverable content of ores, etc.) | 72,477 | 41,602 | 60,558 | 35,729 | 66,417 | 49,547 | 74,345 | 63,193 |
| Fluorspar | 11,890 | (4) | 8,876 | (4) | (4) | (4) | | |
| Gem stones | (9) | (4) | (9) | (4) | (9) | 25 | (9) | 30 |
| Gold (recoverable content of ores, etc.) troy ounces | 2,614 | 91 | 3,539 | 124 | 1,917 | 67 | 3,275 | 115 |
| Gypsum | | | 887 | 3 | | | | |
| Helium thousand cubic feet | 11,158 | 150 | 41,755 | 735 | 53,721 | 946 | 76,072 | 1,350 |
| Iron ore (usable) thousand long tons, gross weight | 8 | (4) | 3 | (4) | 9 | (4) | (4) | (4) |
| Lead (recoverable content of ores, etc.) | 2,943 | 771 | 887 | 243 | 3,296 | 982 | 6,042 | 1,997 |
| Lime | | | | | | | 30,771 | 373 |

**See footnotes at end of table.**

Digitized by Google

## TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

### NEW MEXICO—Continued

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Manganese ore (35 percent or more Mn)—gross weight | | | | | 1,390 | (4) | 22,011 | 1,834 |
| Manganiferous ore (5 to 35 percent Mn)—do | (4) | (4) | 20,546 | 82 | 40,320 | (4) | 38,782 | (4) |
| Mica: | | | | | | | | |
| Scrap | | | | | 84 | 3 | 767 | 22 |
| Sheet—pounds | | | 2,054 | 14 | 9,431 | 65 | 6,247 | 53 |
| Natural gas—million cubic feet | 399,086 | 24,344 | 449,346 | 35,049 | 540,664 | 48,119 | 626,340 | 55,118 |
| Natural-gas liquids: | | | | | | | | |
| Natural gasoline and cycle products—thousand gallons | 171,654 | 10,094 | 224,112 | 11,744 | 261,023 | 15,425 | 306,595 | 16,560 |
| LP-gases—do | 121,212 | 4,618 | 225,994 | 5,704 | 278,403 | 6,767 | 308,218 | 11,065 |
| Perlite | 84,891 | 662 | 111,040 | 886 | 147,805 | 1,091 | 167,705 | 1,271 |
| Petroleum (crude)—thousand 42-gallon barrels | 70,441 | 185,260 | 74,820 | 205,760 | 82,958 | 227,310 | 87,893 | 241,706 |
| Potassium salts—$K_2O$ equivalent | 1,552,831 | 58,076 | 1,732,240 | 64,367 | [17] 1,841,122 | [17] 69,641 | 1,930,754 | 72,802 |
| Pumice | 528,649 | 760 | 363,926 | 1,060 | 393,597 | 780 | 292,330 | 667 |
| Salt (common)—thousand short tons | 62 | 216 | 51 | 333 | 50 | 597 | 58 | 501 |
| Sand and gravel—do | 1,416 | 1,239 | 6,519 | 8,340 | 4,556 | 6,005 | 6,054 | 5,776 |
| Silver (recoverable content of ores, etc.)—troy ounces | 205,309 | 186 | 109,132 | 99 | 251,072 | 227 | 392,967 | 356 |
| Stone—thousand short tons | 625 | 511 | 772 | 714 | 1,573 | 1,547 | 1,268 | 1,272 |
| Tungsten ore and concentrate—60-percent $WO_3$ basis | | | (20) | 1 | 1 | 3 | (20) | 2 |
| Zinc (recoverable content of ores, etc.) | 13,373 | 3,076 | 6 | 1 | 15 | 3,758 | 35,010 | 9,593 |
| Value of items that cannot be disclosed: Carbon dioxide, diatomite (1953–55), molybdenum, magnesium compounds (1954, 1956), rare earth metals concentrates (1956), recovered elemental sulfur, uranium ore (1956), vanadium, and values indicated by footnote 4 | | 1,652 | | 1,673 | | 2,188 | | 26,739 |
| Total New Mexico | | 336,545 | | 373,519 | | [11] 436,494 | | [13] 513,303 |

### NEW YORK

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cement [16]—thousand 376-pound barrels | 14,965 | 39,388 | 14,497 | 38,861 | 17,942 | 52,150 | 18,604 | 57,329 |
| Clays—thousand short tons | 961 | 1,303 | 1,199 | 1,494 | 1,394 | 1,676 | 1,235 | 1,508 |
| Emery | 10,562 | 144 | 9,758 | 132 | 10,735 | 151 | 12,153 | 174 |
| Gem stones | | | | | (9) | (9) | (9) | 2 |
| Gypsum | 987,156 | 3,507 | 1,133,579 | 4,005 | 1,249,119 | 4,404 | 1,140,187 | 4,817 |
| Iron ore (usable)—thousand long tons, gross weight | 3,415 | 36,346 | 2,803 | 31,707 | 3,202 | 38,019 | (4) | (4) |
| Lead (recoverable content of ores, etc.) | 1,435 | 376 | 1,187 | 325 | 1,037 | 309 | 1,608 | 505 |
| Lime | (4) | (4) | (4) | (4) | 82,890 | 1,366 | 86,737 | 1,030 |
| Natural gas—million cubic feet | 2,347 | 742 | 2,598 | 847 | 3,637 | 1,073 | 4,098 | 1,160 |
| Peat | 3,775 | 46 | (4) | (4) | (4) | (4) | 2,900 | 23 |

Digitized by Google

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Petroleum (crude)—thousand 42-gallon barrels | 3,800 | 16,260 | 3,257 | 11,140 | 2,904 | 10,310 | 2,748 | 12,091 |
| Salt (common)—thousand short tons | 3,322 | 17,351 | 3,413 | 22,754 | 3,780 | 25,214 | 3,873 | 27,545 |
| Sand and gravel—do | 22,531 | 23,494 | 30,082 | 29,756 | 25,562 | 25,542 | 27,815 | 28,722 |
| Silver (recoverable content of ores, etc.)—troy ounces | 35,398 | 32 | 84,576 | 31 | 66,162 | 60 | 84,158 | 76 |
| Slate | 113,575 | 1,733 | 114,929 | 1,742 | 90,668 | 1,345 | 64,282 | 944 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | 15,962 | 25,251 | 19,410 | 31,426 | 22,812 | 37,919 | 22,805 | 36,135 |
| Talc | 156,299 | 941 | (4) | (4) | (4) | (4) | (4) | (4) |
| Zinc (recoverable content of ores, etc.) | 51,529 | 11,852 | 53,199 | 11,491 | 53,016 | 13,042 | 59,111 | 16,196 |
| Value of items that cannot be disclosed: Abrasive stone (1953–54), beryllium concentrate (1954), natural cement, abrasive garnet, iron oxide pigments (1955–56), calcareous marl (1953–54), stone (crushed unclassified 1953), recovered elemental sulfur (1954), titanium concentrate, wollastonite and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 8,102 | | 9,883 | | 8,773 | | 52,734 |
| **Total New York** | | 186,868 | | [7] 192,738 | | [7] 216,907 | | [7] 237,016 |

## NORTH CAROLINA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Abrasive stones | (4) | 16 | 587 | 12 | [21] 227 | 12 | [21] 454 | 16 |
| Beryllium concentrate—gross weight | (4) | (4) | (4) | (4) | (4) | (4) | 3 | 2 |
| Clays—thousand short tons | 1,466 | 2,535 | 1,873 | 2,520 | 2,375 | 1,792 | 2,663 | 2,027 |
| Feldspar—long tons | 268,042 | 3,291 | 230,744 | 2,221 | 242,724 | 2,185 | 255,637 | 3,191 |
| Gem stones | | | | | (5) | (5) | (5) | 1 |
| Gold (recoverable content of ores, etc.)—troy ounces | | | 214 | 8 | 190 | 7 | 882 | 31 |
| Lead (recoverable content of ores, etc.) | | | 4 | 1 | 2 | 1 | 10 | 3 |
| Mica: | | | | | | | | |
| Scrap | 56,834 | 1,429 | 61,049 | 1,457 | 60,887 | 1,377 | 47,125 | 1,065 |
| Sheet—pounds | 619,895 | 1,308 | 479,221 | 1,787 | 553,444 | 2,745 | 770,903 | 2,135 |
| Sand and gravel—thousand short tons | 6,911 | 4,993 | 7,441 | 5,508 | 7,786 | 5,911 | 7,581 | 6,264 |
| Silver (recoverable content of ores, etc.)—troy ounces | | | 438 | (5) | 181 | (5) | 753 | 1 |
| Stone—thousand short tons | [6] 9,317 | [6] 14,424 | 10,134 | 15,625 | 10,903 | 16,533 | [6] 8,352 | [6] 11,471 |
| Talc and pyrophyllite | 119,341 | 578 | 112,704 | 389 | 125,206 | 572 | 125,487 | 529 |
| Tungsten concentrate—60-percent $WO_3$ basis | 2,074 | (4) | 2,538 | (4) | 2,609 | (4) | 2,732 | (4) |
| Value of items that cannot be disclosed: Abrasive stone (millstones 1954), asbestos (1953–55), columbium-tantalum concentrate (1953), copper (1954–56), lithium minerals, manganiferous ores (1953), olivine, quartz (1953), stone (dimension and crushed marble 1953, crushed and dimension granite, crushed miscellaneous, and dimension sandstone 1956), vermiculite (1953–55), and values indicated by footnote 4 | | 9,877 | | 12,123 | | 10,075 | | 13,249 |
| Total North Carolina | | 38,451 | | 41,651 | | 41,210 | | 39,985 |

**See footnotes at end of table.**

Digitized by Google

| Mineral | 1955 | | 1954 | | 1953 | | 1952 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousands of dollars) | Short tons (unless otherwise stated) | Value (thousands of dollars) | Short tons (unless otherwise stated) | Value (thousands of dollars) | Short tons (unless otherwise stated) | Value (thousands of dollars) |
| Clays | 23 | 48 | (4) | (4) | (4) | (4) | [5] 62 | [5] 71 |
| Coal (lignite) | 2,803 | 6,618 | (3) | (3) | 3,102 | 7,261 | 2,815 | 6,578 |
| Natural gas | 498 | 34 | 1,093 | 69 | 5,256 | 405 | 11,725 | 950 |
| Petroleum (crude) | 5,183 | 10,370 | 6,025 | 12,890 | 11,143 | 32,200 | 13,495 | 39,136 |
| Pumice | | | | | 3,500 | 10 | 4,840 | 5 |
| Sand and gravel | 6,174 | 2,165 | 7,105 | 2,219 | 11,169 | 2,638 | 5,946 | 4,259 |
| Stone | 35 | 2 | 1 | 4 | 77 | 80 | 83 | 87 |
| Sulfur, recovered elemental | | | | | | | 1,735 | 46 |
| Value of items that cannot be disclosed: Certain nonmetals and values indicated by footnote 4 | | | | 7,041 | | 1,529 | | 2,423 |
| Total North Dakota | | 19,237 | | 22,223 | | 44,123 | | 53,555 |

## OHIO

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cement | 12,532 | 32,957 | 13,077 | 35,929 | 14,914 | 42,966 | 16,065 | 49,794 |
| Clays | 5,635 | 9,328 | 5,051 | 11,137 | 6,297 | 15,677 | 6,703 | 17,675 |
| Coal | 34,737 | 131,475 | 32,469 | 117,520 | 37,870 | 133,814 | 38,934 | 148,650 |
| Lime | 2,945,800 | 35,310 | 2,549,046 | 31,444 | 3,038,949 | 39,394 | 2,995,320 | 40,805 |
| Natural gas | 37,542 | 8,334 | 28,824 | 6,111 | 33,756 | 7,595 | 25,368 | 6,088 |
| Peat | 27,696 | 261 | 29,540 | 357 | 22,484 | 249 | 15,509 | 174 |
| Petroleum (crude) | 3,610 | 9,710 | 3,880 | 10,710 | 4,353 | 12,580 | 4,785 | 15,025 |
| Salt (common) | 3,040 | 7,485 | 2,749 | 12,359 | 2,905 | 14,769 | 2,972 | 15,923 |
| Sand and gravel | 24,032 | 27,076 | 25,827 | 27,873 | 27,906 | 31,995 | 30,200 | 36,146 |
| Stone (except limestone for cement and lime, 1953) | [6] 25,286 | [6] 39,041 | 32,627 | 47,802 | 33,273 | 49,841 | [6] 33,418 | [6] 50,947 |
| Value of items that cannot be disclosed: Abrasive stones, calcium-magnesium chloride, gypsum, natural gasoline, ground sand and sandstone (1953), stone (dimension unclassified 1953, crushed sandstone 1956), recovered elemental sulfur, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 1,265 | | 2,084 | | 2,865 | | 5,394 |
| Total Ohio | | 302,242 | | [7] 293,659 | | [7] 340,457 | | [7] 375,488 |

Digitized by Google

## OKLAHOMA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 578 | 637 | 452 | 1,283 | [5] 724 | [5] 727 | [5] 705 | [5] 701 |
| Coal | do | 2,168 | 13,227 | 1,915 | 11,265 | 2,164 | 12,668 | 2,007 | 12,341 |
| Lead (recoverable content of ores, etc.) | | 9,304 | 2,438 | 14,204 | 3,892 | 14,126 | 4,209 | 12,350 | 3,878 |
| Natural gas | million cubic feet | 599,955 | 41,397 | 616,355 | 43,145 | 614,976 | 45,508 | 678,603 | 54,288 |
| Natural-gas liquids: | | | | | | | | | |
| Natural gasoline and cycle products | thousand gallons | 433,650 | 28,066 | 478,590 | 24,332 | 504,692 | 28,770 | 489,963 | 26,543 |
| LP-gases | do | 414,036 | 14,886 | 453,810 | 13,506 | 512,320 | 14,297 | 579,101 | 23,427 |
| Petroleum (crude) | thousand 42-gallon barrels | 202,570 | 546,940 | 185,851 | 518,520 | 202,817 | 563,830 | 215,862 | 600,096 |
| Pumice | | (4) | (4) | (4) | (4) | | | 305 | 3 |
| Salt | thousand short tons | (4) | (4) | (4) | (4) | (4) | (4) | 10 | 90 |
| Sand and gravel | do | 5,011 | 4,258 | 5,424 | 4,265 | 6,294 | 4,786 | 5,947 | 4,842 |
| Stone (except limestone for cement and lime, 1953) | do | 8,490 | 7,931 | 9,239 | 9,147 | 10,933 | 12,295 | 10,547 | 12,417 |
| Zinc (recoverable content of ores, etc.) | | 33,413 | 7,685 | 43,171 | 9,325 | 41,543 | 10,220 | 27,515 | 7,539 |
| Value of items that cannot be disclosed: Native asphalt, clay (bentonite, 1955–56), cement, gypsum, lime, ground sand and sandstone (1953), stone (dimension limestone 1954), recovered elemental sulfur, tripoli, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 11,538 | | 12,584 | | 15,525 | | 12,965 |
| Total Oklahoma | | | 679,003 | | [7] 650,205 | | [7] 711,089 | | [7] 757,116 |

## OREGON

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Chromite | gross weight | 6,216 | 484 | 6,655 | 538 | 5,341 | 463 | [22] 54,577 | [22] 2,001 |
| Clays | thousand short tons | 292 | 296 | (4) | (4) | 251 | 276 | 257 | 278 |
| Copper (recoverable content or ores, etc.) | | 9 | 5 | 5 | 3 | 4 | 3 | 7 | 6 |
| Gem stones | | (9) | (4) | (9) | (4) | (9) | (4) | (9) | 250 |
| Gold (recoverable content of ores, etc.) | troy ounces | 8,488 | 297 | 6,520 | 228 | 1,708 | 60 | 2,738 | 96 |
| Iron ore (usable) | thousand long tons | | | | | 2 | (4) | 1 | (4) |
| Lead (recoverable content of ores, etc.) | | 5 | 1 | 5 | 1 | 3 | 1 | 5 | 2 |
| Manganese ore (35 percent or more Mn) | gross weight | 46 | (4) | | | | | | |
| Manganiferous ore (5 to 35 percent Mn) | do | 271 | (4) | | | | | | |
| Mercury | 76-pound flasks | 648 | 125 | 489 | 129 | 1,056 | 307 | 1,893 | 492 |
| Nickel (content of ore and concentrate) | | | | 1,993 | (4) | 4,181 | (4) | 6,866 | (4) |
| Pumice | | 73,080 | 174 | 67,852 | 178 | (4) | (4) | (4) | (4) |
| Sand and gravel | thousand short tons | 8,763 | 8,630 | 13,157 | 14,150 | 11,954 | 11,832 | 11,637 | 11,647 |
| Silver (recoverable content of ores, etc.) | troy ounces | 12,259 | 11 | 14,335 | 13 | 8,815 | 8 | 13,542 | 12 |
| Stone (except limestone for cement and lime, 1953) | thousand short tons | [6] 4,939 | [6] 6,302 | 5,872 | 8,618 | 7,742 | 9,418 | 6,098 | 7,890 |
| Value of items that cannot be disclosed: Carbon dioxide, cement, diatomite, iron oxide pigments (1954, 1956), perlite (1953), quartz (1953), sodium carbonate (1956), stone (crushed granite 1953), tungsten concentrate, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 8,124 | | 9,634 | | 10,500 | | 12,679 |
| Total Oregon | | | 24,449 | | [7] 32,268 | | [7] 31,736 | | [7] 34,011 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 5.—Mineral production[1] in the United States,[2] 1953–56, by States—Continued**

PENNSYLVANIA

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Cement.....thousand 376-pound barrels | 42,094 | 114,003 | 43,068 | 117,912 | 48,090 | 141,969 | 51,964 | 162,387 |
| Clays.....thousand short tons | 3,575 | 9,988 | 3,524 | 10,244 | 4,020 | 12,413 | [5] 4,413 | [5] 23,782 |
| Coal: | | | | | | | | |
| Anthracite.....do | 30,949 | 299,140 | 29,083 | 247,870 | 26,205 | 206,097 | 28,900 | 236,785 |
| Bituminous.....do | 93,331 | 516,490 | 72,010 | 378,659 | 85,713 | 440,452 | 90,287 | 479,437 |
| Cobalt (content of concentrate).....pounds | 564,450 | (4) | 517,124 | (4) | 478,840 | (4) | 533,329 | (4) |
| Copper (recoverable content of ores, etc.) | 3,027 | 1,737 | (4) | (4) | (4) | (4) | (4) | (4) |
| Gold (recoverable content of ores, etc.).....troy ounces | 1,134 | 40 | 1,317 | 46 | 1,610 | 56 | (4) | (4) |
| Iron ore (usable).....thousand long tons, gross weight | 1,021 | (4) | 708 | (4) | 838 | (4) | (4) | (4) |
| Iron oxide pigment materials (crude) | | | | | 519 | 7 | 600 | 7 |
| Lime | 1,335,300 | 16,010 | 1,081,583 | 13,206 | 1,424,051 | 17,632 | 1,443,430 | 18,282 |
| Natural gas.....million cubic feet | 105,558 | 30,717 | 145,934 | 43,634 | 99,172 | 29,652 | 104,508 | 33,652 |
| Natural-gas liquids: | | | | | | | | |
| Natural gasoline.....thousand gallons | (4) | (4) | 4,830 | 320 | 4,305 | 281 | 4,081 | 251 |
| LP-gases.....do | 1,008 | 90 | 1,008 | 89 | 995 | 90 | 1,127 | 99 |
| Peat | 8,232 | 48 | 15,621 | 141 | 23,277 | 220 | 20,498 | 213 |
| Petroleum (crude).....thousand 42-gallon barrels | 10,649 | 45,680 | 9,107 | 31,150 | 8,531 | 30,200 | 8,230 | 35,718 |
| Pyrophyllite (sericite schist) | 2,463 | 5 | 1,898 | 9 | (4) | (4) | (4) | (4) |
| Sand and gravel.....thousand short tons | 14,715 | 20,692 | 14,218 | 20,596 | 13,313 | 20,512 | 14,047 | 21,321 |
| Silver (recoverable content of ores, etc.).....troy ounces | 6,972 | 6 | 8,415 | 8 | 10,379 | 9 | (4) | (4) |
| Slate | 202,386 | 4,420 | 194,205 | 4,419 | 186,035 | 4,421 | 153,824 | 4,194 |
| Stone (except limestone for cement and lime, 1953).....thousand short tons | [6] 26,193 | [6] 48,094 | 40,522 | 61,193 | 44,438 | [17] 68,918 | [5] 44,913 | [6] 73,831 |
| Sulfur, recovered elemental.....long tons | (4) | (4) | (4) | (4) | 7,738 | 263 | 11,350 | 386 |
| Tripoli | (4) | (4) | (4) | (4) | [11] 1,090 | [11] 6 | 1,030 | 7 |
| Value of items that cannot be disclosed: Clays (kaolin 1956), gem stones (1955–56), graphite (crystalline 1953), mica, pyrites, ground sand and sandstone (1953), stone (dimension basalt 1953, 1956, shell 1956) and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 14,462 | | 12,549 | | 15,819 | | 16,202 |
| Total Pennsylvania | | 1,121,622 | | [7] 925,545 | | [7 11] 969,910 | | [7] 1,088,867 |

Digitized by Google

## RHODE ISLAND

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sand and gravel | thousand short tons | 898 | 776 | 1,013 | 980 | 1,941 | 1,498 | 1,308 | 1,263 |
| Stone | do | 162 | 617 | (4) | (4) | (4) | (4) | 42 | 221 |
| Value of items that cannot be disclosed: Nonmetals and values indicated by footnote 4 | | | 69 | | 481 | | 336 | | 143 |
| Total Rhode Island | | | 1,462 | | 1,461 | | 1,834 | | 1,627 |

## SOUTH CAROLINA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 964 | 4,802 | 1,136 | 4,702 | 1,086 | 5,463 | 1,087 | 5,450 |
| Mica (sheet) | pounds | | | (4) | (4) | (4) | (4) | 5,400 | 14 |
| Sand and gravel | thousand short tons | 2,976 | 2,565 | 2,814 | 2,550 | 3,127 | 2,677 | 3,229 | 2,926 |
| Stone | do | 2,914 | 3,976 | 2,862 | 4,233 | 3,455 | 4,921 | 3,304 | 4,285 |
| Value of items that cannot be disclosed: Barite, cement, kyanite, scrap mica (1954–56), rare-earth metals concentrates (1956), stone (dimension granite 1953–54, dimension granite and crushed limestone 1956), titanium (1956), vermiculite, and values indicated by footnote 4. Excludes values of clays used for cement (1953) | | | 6,428 | | 6,374 | | 7,400 | | 9,277 |
| Total South Carolina | | | 17,771 | | [12] 17,744 | | [12] 20,197 | | [12] 21,342 |

## SOUTH DAKOTA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Beryllium concentrate | gross weight | 392 | 158 | 337 | 140 | 294 | 157 | 195 | 95 |
| Clays | thousand short tons | 331 | 2,826 | (4) | (4) | (4) | (4) | [5] 201 | [5] 201 |
| Coal (lignite) | do | 24 | 82 | (4) | (4) | 26 | 90 | 25 | 90 |
| Columbium-tantalum concentrate | pounds | 4,431 | 9 | 25,447 | 43 | 5,638 | 10 | 237 | (3) |
| Feldspar | long tons | 50,601 | 321 | (4) | (4) | 42,164 | 267 | 45,226 | 289 |
| Gem stones | | (9) | (4) | (9) | 5 | (9) | 7 | (9) | 10 |
| Gold (recoverable content of ores, etc.) | troy ounces | 534,987 | 18,725 | 541,445 | 18,951 | 529,865 | 18,545 | 568,523 | 19,898 |
| Gypsum | | (4) | (4) | 8,518 | 11 | 12,592 | 16 | 15,794 | 63 |
| Iron ore (usable) | thousand long tons, gross weight | 1 | (4) | 2 | (4) | 2 | (4) | 22 | 101 |
| Lead (recoverable content of ores, etc.) | | 10 | 3 | | | | | | |
| Mica: | | | | | | | | | |
| Scrap | | 1,687 | 27 | 1,510 | 27 | 1,322 | 27 | 1,268 | 31 |
| Sheet | pounds | 11,174 | 77 | 16,299 | 65 | 4,854 | 21 | 12,494 | 57 |
| Natural gas | million cubic feet | 5 | (4) | 7 | (4) | | | | |
| Sand and gravel | thousand short tons | 5,402 | 2,818 | 14,819 | 7,840 | 13,538 | 10,097 | 12,539 | 8,423 |
| Silver (recoverable content of ores, etc.) | troy ounces | 138,642 | 125 | 151,407 | 137 | 154,092 | 140 | 136,118 | 123 |
| Stone (except limestone for cement and lime, 1953) | thousand short tons | [6] 1,189 | [6] 4,997 | 1,615 | 4,929 | 2,262 | 5,680 | 2,200 | 5,725 |
| Tungsten ore and concentrate | 60-percent $WO_3$ basis | 2 | (4) | (20) | 1 | | | | |
| Value of items that cannot be disclosed: Cement, clays (bentonite 1956), lime, lithium minerals (1953–54), petroleum (1954–56), stone (dimension miscellaneous 1953), vanadium (1954), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 3,655 | | 6,121 | | 6,115 | | 7,547 |
| Total South Dakota | | | 33,823 | | [7] 37,874 | | [7] 40,526 | | [7] 41,797 |

See footnotes at end of table.

Digitized by Google

## TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

### TENNESSEE

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Cement—thousand 376-pound barrels | 7,277 | 18,283 | 7,569 | 19,734 | 8,812 | 23,673 | 8,755 | 25,435 |
| Clays—thousand short tons | 1,037 | 3,479 | 1,015 | 3,781 | 1,208 | 4,170 | 1,379 | 4,888 |
| Coal—do | 5,467 | 25,152 | 6,429 | 25,477 | 7,053 | 28,747 | 8,848 | 35,609 |
| Copper (recoverable content of ores, etc.) | 7,829 | 4,494 | 9,087 | 5,362 | 9,911 | 7,394 | 10,449 | 8,882 |
| Fluorspar | 426 | (4) | | | | | (4) | (4) |
| Gold (recoverable content of ores, etc.)—troy ounces | 293 | 10 | 218 | 8 | 221 | 8 | 189 | 7 |
| Iron ore (usable)—thousand long tons, gross weight | 13 | 83 | (4) | (4) | (4) | (4) | (4) | (4) |
| Lead (recoverable content of ores, etc.) | 9 | 2 | | | | | 5 | 1 |
| Lime | 114,474 | 1,178 | 80,372 | 968 | 103,257 | 1,102 | 124,592 | 1,436 |
| Manganese ore (35 percent or more Mn)—gross weight | 2,625 | 202 | 11,823 | 920 | 15,895 | 1,280 | 17,821 | 1,417 |
| Natural gas—million cubic feet | 89 | 11 | 89 | 10 | 39 | 5 | 45 | 6 |
| Petroleum (crude)—thousand 42-gallon barrels | 16 | (4) | (4) | (4) | (4) | (4) | (4) | (4) |
| Phosphate rock—thousand long tons | 1,519 | 11,305 | 1,633 | 11,743 | 1,466 | 10,526 | 1,685 | 11,643 |
| Sand and gravel—thousand short tons | 5,231 | 5,630 | 5,155 | 6,141 | 5,137 | 5,814 | 5,629 | 6,480 |
| Silver (recoverable content of ores, etc.)—troy ounces | 68,935 | 62 | 60,795 | 55 | 66,619 | 60 | 64,878 | 59 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | [5] 10,485 | [5] 16,948 | 14,040 | 22,046 | 14,381 | 22,276 | [5] 15,556 | [5] 23,796 |
| Zinc (recoverable content of ores, etc.) | 38,465 | 8,847 | 30,326 | 6,550 | 40,216 | 9,893 | 46,023 | 12,610 |
| Value of items that cannot be disclosed: Barite, manganiferous ore (1954), scrap mica (1956), pyrites, stone (crushed granite 1953, crushed sandstone 1956), and minerals indicated by footnote 4. Excludes value of clays used for cement (1953) | | 2,364 | | 5,480 | | 6,994 | | 8,772 |
| Total Tennessee | | 98,050 | | [7] 105,686 | | [7] 119,316 | | [7] 137,846 |

### TEXAS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Abrasive stone: Pebbles, grinding | 400 | 5 | (4) | (4) | (4) | (4) | (4) | (4) |
| Cement—thousand 376-pound barrels | 19,140 | 48,498 | 21,928 | 56,674 | 24,856 | 67,549 | 25,966 | 75,695 |
| Clays—thousand short tons | 2,371 | 4,679 | 2,401 | 7,002 | [8] 3,097 | [8] 5,100 | [8] 3,146 | [8] 4,765 |
| Copper (recoverable content of ores, etc.) | | | | | 1 | 1 | | |
| Gem stones | (4) | (4) | (4) | 100 | (4) | 115 | (4) | 115 |
| Gypsum | 1,067,854 | 2,861 | 1,218,048 | 3,773 | 1,349,434 | 4,220 | 1,156,950 | 3,623 |
| Helium—thousand cubic feet | 103,711 | 1,389 | 110,588 | 1,874 | 139,397 | 2,272 | 145,830 | 2,364 |
| Iron ore (usable)—thousand long tons, gross weight | 1,015 | (4) | 915 | (4) | 875 | (4) | (4) | (4) |
| Lime | 475,569 | 4,381 | 547,436 | 5,422 | 584,855 | 5,549 | 802,136 | 6,938 |
| Natural gas—million cubic feet | 4,383,158 | 333,120 | 4,551,232 | 386,855 | [9] 30,798 | 378,464 | 4,990,889 | 434,990 |

Digitized by Google

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Natural-gas liquids: | | | | | | | | |
| Natural gasoline and cycle products—thousand gallons | 2,750,370 | 200,479 | 2,732,100 | 200,559 | 2,987,808 | 206,506 | 2,964,609 | 216,378 |
| LP-gases—do | 2,777,880 | 109,131 | 2,983,962 | 95,913 | 3,450,430 | 110,414 | 3,731,047 | 144,745 |
| Peat | 1,375 | (4) | (4) | (4) | | | | |
| Petroleum (crude)—thousand 42-gallon barrels | 1,019,164 | 2,777,900 | 974,275 | 2,768,490 | 1,053,297 | 2,989,330 | 1,107,808 | 3,097,390 |
| Salt (common)—thousand short tons | 2,845 | 5,011 | 2,864 | 9,310 | 3,583 | 12,867 | 3,963 | 14,370 |
| Sand and gravel—do | 15,101 | 12,845 | 26,316 | 24,841 | 31,518 | 28,480 | 29,336 | 27,213 |
| Silver (recoverable content of ores, etc.)—troy ounces | | | 100 | (5) | 126 | (5) | | |
| Sodium sulfate | (4) | (4) | (4) | (4) | 46,718 | 1,099 | (4) | (4) |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | [6] 9,095 | [6] 8,550 | [6] 25,840 | [6] 29,344 | 27,321 | 33,544 | 32,773 | 36,350 |
| Sulfur (Frasch-process)—long tons | 3,614,838 | 97,601 | 3,474,477 | 92,792 | 3,766,882 | 105,128 | 3,437,061 | 91,026 |
| Sulfur, recovered elemental—do | 84,717 | 2,202 | 107,232 | 2,889 | 114,989 | 3,144 | 140,164 | 3,865 |
| Talc and soapstone | 16,210 | 71 | 19,362 | 128 | 35,064 | 213 | 41,332 | 244 |
| Value of items that cannot be disclosed: Native asphalt, bromine, clay (fuller's earth 1955–56), coal (lignite), graphite, magnesium chloride (for metal), magnesium compounds (except for metal), mercury (1955–56), pumice, stone (crushed basalt 1953, dimension sandstone 1954), uranium ore (1956), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 39,190 | | 52,527 | | 50,069 | | 62,350 |
| Total Texas | | 3,647,913 | | [7] 3,730,705 | | [7] 3,993,310 | | [7] 4,211,284 |

## UTAH

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Asphalt and related bitumens, native: Gilsonite | 60,505 | 2,184 | 75,943 | 2,724 | 82,822 | 3,117 | (4) | (4) |
| Clays—thousand short tons | 188 | 1,448 | (4) | (4) | (4) | (4) | [5] 227 | [5] 492 |
| Coal—do | 6,544 | 37,689 | 5,008 | 29,761 | 6,296 | 40,005 | 6,522 | 34,436 |
| Copper (recoverable content of ores, etc.) | 269,496 | 154,691 | 211,835 | 124,983 | 232,949 | 173,780 | 250,604 | 213,013 |
| Fluorspar | 15,527 | 375 | 4,403 | 82 | 7,328 | 151 | 10,581 | 265 |
| Gem stones | | | | | (9) | 6 | (9) | 10 |
| Gold (recoverable content of ores, etc.)—troy ounces | 483,430 | 16,920 | 403,401 | 14,119 | 441,206 | 15,442 | 416,031 | 14,561 |
| Iron ore (usable)—thousand long tons, gross weight | 4,617 | 26,497 | 3,041 | 19,277 | 3,847 | 24,688 | 4,002 | 27,508 |
| Lead (recoverable content of ores, etc.) | 41,522 | 10,879 | 44,972 | 12,322 | 50,452 | 15,035 | 49,555 | 15,560 |
| Lime | (4) | (4) | 30,428 | 432 | 38,710 | 583 | 55,110 | 830 |
| Manganese ore (35 percent or more Mn)—gross weight | 550 | (4) | 25 | (4) | | | | |
| Manganiferous ore (5 to 35 percent Mn)—do | 5,155 | 82 | 97 | (4) | | | | |
| Natural gas—million cubic feet | 7,075 | 807 | 16,024 | 2,259 | 17,163 | 2,386 | 17,268 | 2,435 |
| Perlite | (4) | (4) | (4) | (4) | (4) | (4) | 2,271 | 9 |
| Petroleum (crude)—thousand 42-gallon barrels | 1,807 | (4) | 1,905 | 4,480 | 2,227 | 5,140 | 2,466 | 5,302 |
| Phosphate rock—thousand long tons | (4) | (4) | (4) | (4) | (4) | (4) | 125 | 772 |
| Pumice | 3,880 | 4 | 3,588 | 4 | 2,041 | 20 | 44,769 | 330 |
| Salt (common)—thousand short tons | 154 | 772 | 167 | 1,020 | 196 | 1,339 | 184 | 1,471 |
| Sand and gravel—do | 4,628 | 3,180 | 5,328 | 3,592 | 5,158 | 3,309 | 5,836 | 4,476 |
| Silver (recoverable content of ores, etc.)—troy ounces | 6,725,807 | 6,087 | 6,179,243 | 5,593 | 6,250,565 | 5,657 | 6,572,041 | 5,948 |
| Stone (except limestone for cement and lime, 1953)—thousand short tons | 997 | 1,447 | 1,127 | 1,546 | 1,926 | 2,650 | 2,322 | 3,298 |
| Tungsten ore and concentrate—60-percent $WO_3$ basis | 35 | 123 | 84 | 309 | 65 | 225 | 11 | 41 |
| Uranium ore | | | | | | | 927,850 | 22,500 |
| Vanadium—pounds | 385,038 | (4) | 575,884 | (4) | 995,873 | (4) | 1,098,802 | (4) |

**See footnotes at end of table.**

Digitized by Google

## TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

### UTAH—Continued

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Zinc (recoverable content of ores, etc.) | 29,184 | 6,712 | 34,031 | 7,351 | 43,556 | 10,715 | 42,374 | 11,610 |
| Value of items that cannot be disclosed: Carbon dioxide, cement, clay (kaolin 1956), gypsum, molybdenum, natural gasoline, potassium salts, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 28,692 | | 26,203 | | 28,733 | | 33,249 |
| Total Utah | | 298,589 | | [13] 255,495 | | [13] 331,929 | | [13] 396,942 |

### VERMONT

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays—thousand short tons | (4) | (4) | (4) | (4) | 14 | 14 | (4) | (4) |
| Copper (recoverable content of ores, etc.) | 3,947 | 2,265 | 4,352 | 2,568 | 4,305 | 3,212 | 3,403 | 2,893 |
| Gold (recoverable content of ores, etc.)—troy ounces | 171 | 6 | 185 | 6 | 181 | 6 | (4) | (4) |
| Pyrites—long tons | 19,486 | (4) | 20,713 | (4) | 21,685 | (4) | 22,537 | 107 |
| Sand and gravel—thousand short tons | 1,114 | 690 | 1,482 | 1,111 | 1,763 | 1,169 | 1,910 | 905 |
| Silver (recoverable content of ores, etc.)—troy ounces | 43,128 | 39 | 48,572 | 44 | 50,447 | 46 | (4) | (4) |
| Slate | (4) | (4) | (4) | (4) | (4) | (4) | 162,239 | 3,722 |
| Stone (except limestone for lime, 1953)—thousand short tons | 527 | 8,860 | 437 | 8,178 | 582 | 11,061 | 621 | 11,622 |
| Talc | 80,209 | 241 | 66,195 | 199 | (4) | (4) | (4) | (4) |
| Value of items that cannot be disclosed: Asbestos, gem stones (1955), lime, and values indicated by footnote 4 | | 8,201 | | 8,401 | | 8,400 | | 3,915 |
| Total Vermont | | 20,302 | | [13] 20,483 | | [13] 23,884 | | [13] 23,131 |

### VIRGINIA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Beryllium concentrate—gross weight | | | (4) | (4) | (4) | (4) | 1 | (4) |
| Clays—thousand short tons | 952 | 928 | 705 | 723 | 936 | 874 | 1,000 | 1,033 |
| Coal—do | 19,119 | 102,022 | 16,387 | 72,901 | 23,508 | 108,174 | 28,063 | 138,127 |
| Lead (recoverable content of ores, etc.) | 2,788 | 730 | 4,320 | 1,184 | 2,997 | 893 | 3,035 | 953 |
| Lime | 477,384 | 4,947 | 445,158 | 4,611 | 494,293 | 5,049 | 512,346 | 5,926 |
| Manganese ore (35 percent or more Mn)—gross weight | 8,454 | 636 | 22,678 | 1,781 | 32,654 | 2,779 | 20,231 | 1,902 |
| Marl, calcareous (except for cement) | (4) | (4) | 33,174 | 21 | (4) | (4) | 10,522 | 12 |
| Mica, sheet—pounds | (4) | (4) | (4) | (4) | (4) | (4) | 396 | 6 |

Digitized by Google

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Natural gas ..... million cubic feet | 3,607 | 954 | 1,401 | 380 | 968 | 259 | 2,926 | 810 |
| Petroleum (crude) ..... thousand 42-gallon barrels | 8 | (4) | 7 | (4) | 4 | (4) | (4) | (4) |
| Sand and gravel ..... thousand short tons | 5,276 | 5,161 | 7,115 | 8,658 | 6,461 | 8,076 | 7,783 | 9,240 |
| Silver (recoverable content of ores, etc.) ..... troy ounces | 1,169 | 1 | 1,773 | 2 | 1,850 | 2 | 1,874 | 2 |
| Slate | (4) | (4) | 17,410 | 469 | 31,536 | 820 | 31,894 | 1,035 |
| Stone (except limestone for cement and lime, 1953) ... thousand short tons | 9,092 | 16,259 | 10,894 | 18,138 | 11,966 | 19,870 | 14,082 | 23,076 |
| Zinc (recoverable content of ores, etc.) | 16,676 | 3,835 | 16,738 | 3,615 | 18,329 | 4,509 | 19,196 | 5,181 |
| Value of items that cannot be disclosed: Aplite, cement, feldspar, gem stones (1955), gypsum, iron ore (1953–54), iron oxide pigments (1954–56), kyanite, manganiferous ore (1956), mica (scrap 1953–55), pyrites, salt, ground sand and sandstone (1953), talc and soapstone, titanium concentrate and minerals indicated by footnote 4. Excludes value of clays used for cement (1953) | | 17,506 | | 19,403 | | 24,046 | | 24,931 |
| Total Virginia | | 152,979 | | r 129,603 | | r 172,541 | | r 208,806 |

## WASHINGTON

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Abrasive stone: Pebbles (grinding) | (4) | (4) | (4) | (4) | (4) | (4) | 25 | (5) |
| Barite | | | (4) | (4) | 25 | (5) | | |
| Chromite ..... gross weight | | | | | 22 | 2 | 30 | 3 |
| Clays ..... thousand short tons | 259 | 312 | 261 | 318 | 365 | 412 | 320 | 440 |
| Coal ..... do | 690 | 5,048 | 619 | 4,478 | 610 | 4,263 | 473 | 3,432 |
| Copper (recoverable content of ores, etc.) | 3,740 | 2,147 | 3,636 | 2,145 | 3,958 | 2,953 | 2,926 | 2,487 |
| Epsomite | 200 | 8 | (4) | (4) | 100 | 5 | (4) | (4) |
| Gem stones | (5) | (4) | (5) | (4) | (5) | (4) | (5) | 75 |
| Gold (recoverable content of ores, etc.) ..... troy ounces | 62,560 | 2,189 | 66,740 | 2,336 | 74,360 | 2,602 | 70,669 | 2,473 |
| Gypsum | 3,800 | 14 | (4) | (4) | 3,500 | 14 | (4) | (4) |
| Iron ore ..... thousand long tons | | | | | 2 | (4) | 2 | (4) |
| Lead (recoverable content of ores, etc.) | 11,064 | 2,899 | 9,938 | 2,723 | 10,340 | 3,081 | 11,657 | 3,660 |
| Peat | 32,107 | 104 | 43,134 | 153 | 37,640 | 113 | 37,043 | 129 |
| Pumice | (4) | (4) | (4) | (4) | (4) | (4) | 5,291 | 15 |
| Sand and gravel ..... thousand short tons | 11,183 | 9,318 | 16,045 | 13,595 | 21,645 | 19,351 | 16,842 | 15,037 |
| Silver (recoverable content of ores, etc.) ..... troy ounces | 321,202 | 290 | 313,735 | 284 | 436,348 | 395 | 448,442 | 406 |
| Stone (except limestone for cement and lime, 1953) .. thousand short tons | 4,438 | 5,891 | 5,367 | 9,527 | 6,593 | 10,580 | 8,057 | 11,660 |
| Talc and soapstone | 5,351 | 29 | (4) | (4) | (4) | (4) | (4) | (4) |
| Tungsten ore and concentrate ..... 60-percent $WO_3$ basis | 5 | 20 | 18 | 66 | 12 | 46 | 2 | (4) |
| Zinc (recoverable content of ores, etc.) | 32,786 | 7,541 | 22,304 | 4,818 | 29,536 | 7,266 | 25,609 | 7,017 |
| Value of items that cannot be disclosed: Carbon dioxide, cement, diatomite, lime, magnesite, manganese ore (1953), olivine, quartz (1953), ground sand and sandstone (1953), strontium minerals (1956), uranium ore (1956), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 18,767 | | 16,924 | | 19,765 | | 17,678 |
| Total Washington | | 54,577 | | r 53,300 | | r 67,334 | | r 61,665 |

**See footnotes at end of table.**

Digitized by Google

## TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

### WEST VIRGINIA

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Clays.....thousand short tons | 969 | 2,489 | 587 | 1,451 | 707 | 2,563 | 770 | 2,449 |
| Coal.....do | 134,105 | 693,594 | 115,996 | 541,370 | 139,168 | 653,388 | 155,890 | 824,043 |
| Marl, calcareous | (4) | (4) | (4) | (4) | (4) | (4) | 1,685 | 1 |
| Natural gas.....million cubic feet | 186,477 | 44,009 | 191,601 | 45,601 | 212,403 | 49,915 | 204,717 | 48,518 |
| Natural-gas liquids: | | | | | | | | |
| Natural gasoline.....thousand gallons | 44,352 | 3,245 | 41,076 | 2,593 | 35,756 | 2,352 | 35,728 | 2,594 |
| LP-gases.....do | 153,090 | 6,743 | 142,884 | 5,035 | 286,871 | 6,376 | 240,989 | 12,031 |
| Petroleum (crude).....thousand 42-gallon barrels | 3,038 | 11,570 | 2,902 | 8,500 | 2,320 | 7,080 | 2,179 | 8,411 |
| Salt (common).....thousand short tons | 420 | 1,490 | 472 | 2,886 | 638 | 3,477 | 681 | 3,453 |
| Sand and gravel.....do | 3,163 | 6,071 | 4,074 | 8,351 | 5,171 | 9,779 | 5,110 | 10,711 |
| Stone (except limestone for cement and lime, 1953).....thousand short tons | [6] 5,501 | [6] 8,924 | 7,315 | 11,743 | 5,899 | 9,714 | 6,579 | 10,765 |
| Value of items that cannot be disclosed: Abrasive stone (1953, 1955), bromine, calcium-magnesium chloride, cement, lime, ground sand and sandstone (1953), stone (dimension limestone (1953)), recovered elemental sulfur, and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | 11,975 | | 10,504 | | 12,930 | | 14,590 |
| Total West Virginia | | 790,110 | | [7] 636,311 | | [7] 755,512 | | [7] 935,074 |

### WISCONSIN

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Abrasive stone: Pebbles (grinding) | (4) | (4) | (4) | (4) | (4) | (4) | 1,093 | 31 |
| Clays.....thousand short tons | 175 | 175 | 180 | 174 | 165 | 166 | 163 | 172 |
| Iron ore (usable).....thousand long tons, gross weight | 1,655 | (4) | 1,429 | (4) | 1,886 | (4) | 1,488 | (4) |
| Lead (recoverable content of ores, etc.) | 2,094 | 549 | 1,261 | 346 | 1,948 | 581 | 2,582 | 811 |
| Lime | 123,997 | 1,566 | 115,397 | 1,558 | 134,635 | 1,768 | (4) | (4) |
| Marl, calcareous (except for cement) | 15,871 | 7 | 19,607 | 10 | 14,087 | 7 | 11,074 | 6 |
| Peat | 366 | (4) | (4) | (4) | | | | |
| Sand and gravel.....thousand short tons | 23,664 | 16,253 | 23,979 | 17,396 | 27,978 | 19,988 | 27,715 | 19,097 |
| Stone (except limestone for cement and lime, 1953).....thousand short tons | 7,450 | 15,980 | 8,289 | 16,188 | 12,180 | 18,843 | 11,126 | 20,402 |
| Zinc (recoverable content of ores, etc.) | 16,830 | 3,871 | 15,534 | 3,355 | 18,326 | 4,508 | 22,890 | 6,546 |
| Value of items that cannot be disclosed: Abrasive stone (tube-mill liners), cement, quartz (1953), ground sand and sandstone (1953), stone (crushed basalt 1955), and values indicated by footnote 4 | | 16,811 | | 15,840 | | 20,528 | | 19,451 |
| Total Wisconsin | | 55,212 | | [6] 54,286 | | [6] 65,813 | | [6] 65,860 |

Digitized by Google

## WYOMING

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clays | thousand short tons | 853 | 10,037 | 944 | 9,534 | 10,036 | 10,924 | 1,053 | 11,832 |
| Coal | do | 5,245 | 23,744 | 2,831 | 11,541 | 2,927 | 11,845 | 2,553 | 9,920 |
| Copper (recoverable content of ores, etc.) | | 1 | [3] | 1 | 1 | | | 3 | 3 |
| Feldspar | long tons | [4] | [4] | | | | | 1,201 | 8 |
| Gem stones | | [5] | [4] | [5] | [4] | [5] | 57 | [5] | 75 |
| Gold (recoverable content of ores, etc.) | troy ounces | 1 | [3] | 407 | 14 | 52 | 2 | 762 | 27 |
| Gypsum | | 5,493 | 22 | 7,403 | 30 | 22,373 | 89 | 11,380 | 46 |
| Iron ore (usable) | thousand long tons, gross weight | 654 | [4] | 458 | [4] | 749 | [4] | 650 | [4] |
| Natural gas | million cubic feet | 76,262 | 6,025 | 71,068 | 5,970 | 77,819 | 6,615 | 84,398 | 7,258 |
| Natural-gas liquids: | | | | | | | | | |
| Natural gasoline | thousand gallons | [4] | [4] | 47,082 | 3,137 | 40,290 | 2,775 | 48,859 | 3,160 |
| LP-gases | do | [4] | [4] | 46,084 | 2,128 | 46,106 | 1,961 | 49,838 | 2,337 |
| Petroleum (crude) | thousand 42-gallon barrels | 82,618 | 195,800 | 93,533 | 229,160 | 99,483 | 239,750 | 104,830 | 255,785 |
| Phosphate rock | thousand long tons | [4] | [4] | [4] | [4] | 55 | 345 | 119 | 721 |
| Pumice | | 648 | 2 | [4] | [4] | [4] | [4] | 45,517 | 38 |
| Sand and gravel | thousand short tons | 3,149 | 2,001 | 4,164 | 2,682 | 3,952 | 3,978 | 3,904 | 2,935 |
| Silver (recoverable content of ores, etc.) | troy ounces | 11 | [3] | 74 | [3] | 20 | [3] | 154 | [3] |
| Sodium carbonate (natural) | | [4] | [4] | [4] | [4] | [4] | [4] | 337,851 | 8,345 |
| Stone (except limestone for cement, 1953) | thousand short tons | 1,431 | 1,840 | 1,616 | 1,665 | 1,303 | 2,034 | 1,333 | 2,076 |
| Sulfur, recovered elemental | long tons | [4] | [4] | 113,101 | 2,978 | 120,697 | 3,206 | 121,161 | 3,214 |
| Tungsten ore and concentrate | 60 percent $WO_3$ basis | | | | | | | 2 | [4] |
| Uranium ore | | | | | | | | 107,400 | 2,100 |
| Vermiculite | | 403 | 2 | | | | | | |
| Value of items that cannot be disclosed: Beryllium concentrate (1956), cement, manganiferous ore (1953), sodium sulfate, sulfur ore (1953), vanadium (1954–56), and values indicated by footnote 4. Excludes value of clays used for cement (1953) | | | 16,433 | | 12,827 | | 14,983 | | 7,831 |
| Total Wyoming | | | 255,906 | | [7] 281,306 | | [7] 297,752 | | [7] 316,897 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Includes Alaska and Hawaii.
[3] Excludes pozzolan cement, value for which is included with "Items that cannot be disclosed."
[4] Figure withheld to avoid disclosing individual company confidential data.
[5] Excludes certain clays, value for which is included with "Items that cannot be disclosed."
[6] Excludes certain stone, value included with "Items that cannot be disclosed."
[7] Total adjusted to eliminate duplicating the value of clays and stone.
[8] Less than $1,000.
[9] Weight not recorded.
[10] Less than 1,000 short tons.
[11] Revised figure.
[12] Sheet mica only.
[13] Total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and/or lime.
[14] Beginning with 1954 sand and sandstone (ground) included with sand and gravel or stone.
[15] Includes value of nonmetals; excludes value of clays used for cement.
[16] Excludes natural cement, value for which is included with "Items that cannot be disclosed."
[17] Final figure. Supersedes preliminary figure given in commodity chapter.
[18] Excludes masonry cement, value for which is included with "Items that cannot be disclosed."
[19] Recoverable zinc valued at the yearly average price of Prime Western slab zinc, East St. Louis market. Represents value established after transportation, smelting, and manufacturing charges have been added to the value of ore at mine.
[20] Less than 1 ton.
[21] Grinding pebbles and tube-mill liners, weight of millstones not recorded.
[22] Includes 45,710 short tons of concentrate produced in 1955 and 1956 from low-grade ore and concentrate stockpiled near Coquille, Oreg., during World War II.

405877—59——4

Digitized by Google

**TABLE 6.—Mineral production [1] in the Canal Zone and islands administered by the United States,[2] 1953–56**

| | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| American Samoa: | | | | | | | | |
| Sand and gravel, thousand short tons | 1 | (3) | 2 | 1 | 1 | 1 | | |
| Stone, do | 75 | 17 | 58 | 15 | 9 | 4 | 2 | 6 |
| Total American Samoa | | 17 | | 16 | | 5 | | 6 |
| Canal Zone: | | | | | | | | |
| Sand and gravel, thousand short tons | 86 | 95 | | | 36 | 47 | 40 | 48 |
| Stone (crushed), do | 172 | 232 | 187 | 245 | 169 | 240 | 177 | 230 |
| Total Canal Zone | | 327 | | 245 | | 287 | | 278 |
| Canton: Stone (crushed), thousand short tons | 4 | 9 | 3 | 5 | 1 | 2 | 2 | 5 |
| Guam: | | | | | | | | |
| Sand and gravel, do | | | | | | | 19 | 24 |
| Stone, do | 2,081 | 5,573 | 843 | 2,275 | 1,241 | 3,352 | 341 | 311 |
| Total Guam | | 5,573 | | 2,275 | | 3,352 | | 335 |
| Johnston: Stone, thousand short tons | | | (4) | (3) | 12 | 33 | | |
| Midway: Stone (crushed), do | (4) | 1 | (4) | 2 | | | 203 | 304 |
| Virgin Islands: Stone (crushed), do | 11 | 46 | 4 | 17 | 1 | 5 | 12 | 32 |
| Wake: Stone (crushed), do | 12 | 21 | 1 | 1 | 1 | 3 | 22 | 22 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Production data for Canton and Wake furnished by the U. S. Department of Commerce, Civil Aeronautics Administration; Midway and Johnston, by the U. S. Department of the Navy; Guam by the Government of Guam; American Samoa, by the Government of American Samoa.
[3] Less than $1,000.
[4] Less than 1,000 short tons.

Digitized by Google

**TABLE 7.—Mineral production [1] in the Commonwealth of Puerto Rico, 1953–56**

| Mineral | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Cement.....thousand 376-pound barrels | 3,641 | 9,335 | 3,682 | 9,663 | 4,117 | 12,507 | 4,255 | 14,065 |
| Clays.....thousand short tons | [2] | [2] | [2] | [2] | 137 | 122 | 143 | 129 |
| Iron ore (usable).....thousand long tons, gross weight | 143 | 245 | | | | | | |
| Lime..... | 7,338 | 158 | 8,384 | 199 | 10,392 | 254 | [2] | [2] |
| Salt (common).....thousand short tons | 14 | 132 | 9 | 98 | 10 | 112 | 10 | 101 |
| Sand and gravel.....do | 227 | 250 | 375 | 834 | 433 | 679 | 183 | 192 |
| Stone (except limestone for cement and lime, 1953)..thousand short tons | [3] 648 | [3] 1,237 | [3] 1,752 | [3] 2,493 | 1,784 | 2,516 | 2,076 | 2,556 |
| Value of items that cannot be disclosed: Other nonmetals and values indicated by footnote 2..... | | 44 | | 154 | | | | 195 |
| Total Puerto Rico..... | | 11,401 | | [4] 12,381 | | [4] 14,917 | | [4] 16,395 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Excludes certain stone, value for which is included with "Items that cannot be disclosed."
[4] Total has been adjusted to eliminate duplicating the value of stone.

Digitized by Google

## ...principal minerals imported for consumption in the United States, 1955–56

...rice and Elsie D. Page, Division of Foreign Activities, Bureau of Mines, from records of the Bureau of the Census]

| Mineral | | 1955 | | 1956 | |
|---|---|---|---|---|---|
| | | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| METALS | | | | | |
| | | 177,652 | [1] 74,695 | 216,401 | 100,137 |
| | | [2] 40,851 | [1 2] 16,393 | 25,992 | [1] 10,770 |
| | | 20,972 | [1] 13,973 | 22,582 | [1] 16,480 |
| | | [2] 7,514 | [2] 1,877 | 6,572 | 1,762 |
| | | 46 | 19 | 46 | 23 |
| | | 3,667 | 1,860 | 4,321 | 2,245 |
| | | 2,210 | 926 | 1,479 | 636 |
| | | 7,222 | 765 | 6,422 | 745 |
| | | [2] 4,882,373 | [2] 36,656 | [2] 5,670,013 | 44,414 |
| ...or manufacture of firebrick | long tons | 107,694 | 2,453 | 138,716 | 3,198 |
| | do | (4) | (4) | 9,960 | 221 |
| | | 6,037 | 2,226 | 12,371 | 4,459 |
| | pounds | 603,649 | 1,128 | 924,614 | 1,830 |
| | do | 40,837 | 75 | 93,675 | 172 |
| | do | 927,495 | 1,320 | 3,115,638 | 4,640 |
| ...content) | do | 1,832,827 | 1,146 | 1,451,889 | 876 |
| | do | 699,799 | 835 | 8,387 | 10 |
| | | 1,844 | 58 | 1,855 | 60 |
| ...$Cr_2O_3$ content) | | [2] 765,280 | [2] 38,063 | 919,255 | 49,350 |
| ...content) | | 19,397 | 8,011 | 25,969 | 11,347 |
| | | 268 | 434 | 409 | [1] 687 |
| | pounds | 2,464,336 | (4) | 2,013,463 | (4) |
| | do | 223 | (4) | 5,839 | 3 |
| | do | 15,535,040 | 38,585 | 12,974,393 | 32,910 |
| | do | 1,072,950 | 1,792 | 828,450 | [1] 1,413 |
| ...gross weight) | do | 361,600 | 249 | 397,711 | 247 |
| | do | 9,612,576 | [2] 19,912 | 5,690,553 | 8,387 |
| | | 7,476 | 4,948 | 6,089 | 4,049 |
| | | 105,045 | 68,406 | 74,651 | 54,514 |
| | | 6,386 | 4,515 | 5,198 | 4,395 |
| | | 253,693 | 182,073 | 276,085 | [1] 225,932 |
| | | [2] 202,312 | [2] 154,137 | 191,812 | 157,944 |
| | | [2] 12,577 | [2] 9,030 | 5,410 | [1] 3,463 |
| | | [2] 8,295 | [1 2] 5,170 | 4,310 | [1] 3,003 |
| ...(silicon content) | | 5,963 | [1] 1,993 | 5,005 | 1,737 |
| | troy ounces | 1,071,270 | 37,340 | 1,197,136 | 41,785 |
| | do | 1,858,736 | 67,080 | 2,532,611 | 90,882 |
| | long tons | [2] 23,471,956 | [2] 177,457 | 30,431,152 | 250,527 |
| | do | 3,879 | [1] 16 | 1,430 | 6 |
| | | 283,559 | 14,564 | 326,700 | 17,842 |
| ...ents (major): | | | | | |
| | | [2] 393,919 | [1 2] 34,750 | 382,769 | [1] 44,005 |
| | | [2] 676,170 | [1 2] 91,043 | 1,094,796 | [1] 161,089 |
| | | [2] 196,372 | [1 2] 6,150 | 222,936 | [1] 10,381 |
| | | 32,167 | 839 | 32,633 | [1] 932 |
| ...ate (lead content) | | 156,433 | [1] 38,143 | 191,302 | 50,621 |
| ...content) | | | | 31 | 11 |
| ...content) | | 263,977 | 73,032 | 262,204 | [1] 77,719 |
| ...etc. (lead content) | | 18,944 | [1] 3,931 | 20,464 | [1] 5,268 |
| ...shot | | 2,048 | 535 | 7,654 | [1] 2,017 |
| ...solder (lead content) | | [2] 1,283 | [1 2] 1,911 | 2,526 | [1] 3,381 |
| ...antimonial lead (lead content) | | 13,213 | 4,379 | 8,500 | 2,763 |
| | | 250 | [1] 164 | 235 | [1] 184 |

...at end of table.

Digitized by Google

**TABLE 8.—Principal minerals imported for consumption in the United States, 1955–56—Continued**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| Magnesium: | | | | |
| Metallic and scrap | 1,844 | 1,034 | 630 | 304 |
| Alloys (magnesium content) | 9 | 52 | 24 | 203 |
| Sheets, tubing, ribbons, wire and other forms (magnesium content) | 4 | 24 | 2 | 8 |
| Manganese: | | | | |
| Ore (35 percent or more manganese) (manganese content) | [3] 1,047,152 | 69,821 | 1,005,998 | 69,653 |
| Ferromanganese (manganese content) | [3] 52,236 | [3] 11,898 | 123,953 | 28,512 |
| Spiegeleisen, less than 30 percent manganese, more than 1 percent carbon | ---------- | ---------- | 234 | 18 |
| Mercury: | | | | |
| Compounds—pounds | 20,408 | 77 | 27,985 | [1] 100 |
| Metal—flasks | 20,354 | 5,149 | 47,316 | 11,010 |
| Minor metals: Selenium and salts—pounds | 191,928 | [1] [3] 1,483 | 234,969 | [1] 3,452 |
| Molybdenum: Ore and concentrates (molybdenum content)—pounds | 134,395 | 142 | ---------- | ---------- |
| Nickel: | | | | |
| Ore and matte | 9,088 | 3,264 | 12,820 | 4,502 |
| Pigs, ingots, shot, cathodes | 109,404 | 148,925 | 106,534 | [1] 152,409 |
| Scrap | [3] 464 | [3] 693 | 1,078 | [1] 1,479 |
| Oxide | 32,896 | [3] 29,894 | 32,955 | 31,776 |
| Platinum group: | | | | |
| Unrefined materials: | | | | |
| Ore and concentrates—troy ounces | 407 | 29 | ---------- | ---------- |
| Grain and nuggets, including crude, dust, and residues—troy ounces | 40,713 | 2,787 | 34,016 | 2,854 |
| Sponge and scrap—do | 8,362 | [1] 653 | 8,204 | 764 |
| Osmiridium—do | 1,471 | 115 | 971 | 56 |
| Refined metal: | | | | |
| Platinum—do | 450,270 | [1] 34,419 | 433,872 | 40,628 |
| Palladium—do | 487,174 | 8,185 | 530,686 | [1] 10,958 |
| Iridium—do | 271 | 24 | 2,323 | 203 |
| Osmium—do | 528 | 38 | 347 | 25 |
| Rhodium—do | 17,783 | 1,787 | 20,323 | 2,039 |
| Ruthenium—do | 2,961 | 124 | 2,220 | 87 |
| Radium: | | | | |
| Radium salts—milligrams | 65,545 | 975 | 43,221 | 633 |
| Radioactive substitutes | (6) | 189 | (6) | [1] 514 |
| Rare earths: Ferrocerium and other cerium alloy—pounds | 6,234 | 25 | 12,536 | 40 |
| Silver: | | | | |
| Ore and base bullion—troy ounces | 55,658,175 | 45,755 | 63,125,065 | 52,900 |
| Bullion—do | 28,861,015 | 25,413 | 99,706,716 | 75,209 |
| Tantalum: Ore—pounds | 1,907,686 | [3] 4,820 | 1,312,865 | 1,180 |
| Tin: | | | | |
| Ore (tin content)—long tons | 20,112 | [1] 36,773 | 16,688 | 32,317 |
| Blocks, pigs, grains, etc—do | [3] 64,815 | [3] 131,606 | 62,590 | 136,412 |
| Dross, skimmings, scrap, residues, and tin alloys, n. s. p. f.—pounds | [3] 13,702,355 | [1] [3] 10,383 | 11,364,288 | [1] 9,430 |
| Tinfoil, powder, flitters, etc | (6) | [1] 559 | (6) | [1] 605 |
| Titanium: | | | | |
| Ilmenite | 353,351 | 7,031 | 359,281 | [1] 9,198 |
| Rutile | 19,526 | 1,984 | 48,906 | 7,148 |
| Metal—pounds | 1,134,098 | [1] 3,433 | 4,095,621 | 9,509 |
| Ferrotitanium—do | 63,400 | 27 | 225,967 | 92 |
| Compounds and mixtures—do | 338,061 | 83 | 1,387,548 | [1] 354 |
| ungsten (tungsten content): | | | | |
| Ore and concentrates—do | 20,699,528 | 56,155 | 20,860,153 | [1] 58,011 |
| Metal—do | 89,221 | [1] 241 | 37,456 | 119 |
| Ferrotungsten—do | 676,988 | 1,276 | 870,621 | 1,945 |
| Other—do | 44,861 | 152 | 146,653 | [1] 328 |
| Vanadium: Ore (vanadium content)—do | [7] 184,737 | [7] 104 | ---------- | ---------- |
| Zinc: | | | | |
| Ores (zinc content) | [3] 384,648 | [3] 36,811 | 462,379 | 49,231 |
| Blocks, pigs, and slabs | 195,059 | 46,452 | 244,726 | 65,034 |
| Sheets | 431 | [1] 148 | 454 | 172 |
| Old, dross, and skimmings | 284 | 32 | 602 | 97 |
| Dust | 72 | [1] 18 | 72 | [1] 18 |
| Manufactures | (6) | [1] 190 | (6) | [1] 287 |
| Zirconium: Ore, including zirconium sand | 29,091 | 813 | 31,140 | 792 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 8.—Principal minerals imported for consumption in the United States, 1955–56—Continued**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| **NONMETALS** | | | | |
| Abrasives: Diamonds (industrial)—carats | [2] 15,108,085 | [2] 66,312 | 16,401,781 | [1] 74,295 |
| Asbestos | 740,423 | [1] 60,958 | 689,034 | [1] 61,829 |
| Barite: | | | | |
| Crude and ground | 359,931 | [1] 2,191 | 583,597 | [1] 3,577 |
| Witherite | 2,363 | 78 | 2,934 | 110 |
| Chemicals | [2] 4,466 | 458 | 4,956 | [1] 467 |
| Bromine—pounds | 692 | 118 | 2,918 | 135 |
| Cement—376-pound barrels | 5,219,700 | [1] 14,354 | 4,456,120 | [1] 14,189 |
| Clays: | | | | |
| Raw | 189,138 | [1] 2,857 | 172,244 | [1] 2,873 |
| Manufactured | 3,244 | [1] 86 | 3,617 | [1] 98 |
| Cryolite | 21,980 | 3,190 | 23,122 | 2,901 |
| Feldspar: Crude—long tons | 105 | 9 | 258 | 9 |
| Fluorspar | 363,420 | [1] 8,540 | 485,552 | [1] 11,225 |
| Gem stones: | | | | |
| Diamonds—carats | [2] 1,774,496 | [1] [2] 151,633 | 1,881,474 | [1] 162,039 |
| Emeralds—do | 45,235 | 1,565 | 50,931 | [1] 1,688 |
| Other | (6) | [1] 22,127 | (6) | [1] 24,009 |
| Graphite | 48,800 | 2,387 | 47,888 | [1] 2,594 |
| Gypsum: | | | | |
| Crude, ground, calcined | [2] 3,978,042 | [1] [2] 6,331 | 4,336,650 | [1] 7,853 |
| Manufactures | (6) | 943 | (6) | [1] 693 |
| Iodine, crude—pounds | 1,231,994 | 1,513 | 1,704,868 | 2,180 |
| Jewel bearings—number, thousands | 66,100 | [1] 2,875 | 54,800 | [1] 2,456 |
| Kyanite | 7,581 | 339 | 6,951 | 306 |
| Lime: | | | | |
| Hydrated | 1,359 | [1] 18 | 757 | 12 |
| Other | 30,264 | 559 | 31,903 | 549 |
| Dead-burned dolomite | 7,993 | 558 | 9,031 | 587 |
| Magnesium: | | | | |
| Magnesite | 106,253 | 6,873 | 102,765 | 6,446 |
| Compounds | 12,357 | [1] 396 | 13,423 | [1] 497 |
| Mica: | | | | |
| Uncut sheet and punch—pounds | 1,747,106 | 3,334 | 1,958,907 | [1] 3,748 |
| Scrap | 9,461 | 121 | 7,218 | 79 |
| Manufactures | 6,156 | [1] 7,814 | 5,411 | [1] 7,926 |
| Mineral-earth pigments: | | | | |
| Iron oxide pigments: | | | | |
| Natural | 3,702 | 161 | 3,168 | 138 |
| Synthetic | 6,394 | [1] 850 | 5,997 | [1] 879 |
| Ocher, crude and refined | 218 | 15 | 206 | 12 |
| Siennas, crude and refined | 940 | [1] 80 | 722 | [1] 71 |
| Umber, crude and refined | 2,654 | [1] 79 | 2,762 | 89 |
| Vandyke brown | 151 | 9 | 200 | 12 |
| Nitrogen compounds (major) | [2] 1,584,831 | [1] [2] 75,285 | 1,473,260 | [1] 67,431 |
| Phosphate, crude—long tons | 117,256 | 2,703 | 109,891 | 2,626 |
| Phosphatic fertilizers—do | 29,239 | [1] 1,788 | 32,251 | 1,906 |
| Pigments and salts: | | | | |
| Lead pigments and salts | 1,146 | 267 | 5,851 | [1] 1,530 |
| Zinc pigments and salts | 4,749 | 904 | 5,793 | [1] 1,146 |
| Potash | [2] 330,563 | 11,769 | 333,952 | [1] 12,018 |
| Pumice: | | | | |
| Crude or unmanufactured | 29,938 | [1] 165 | 19,487 | 111 |
| Whole or partly manufactured | 1,497 | [1] 39 | 1,315 | 51 |
| Manufactures, n. s. p. f. | (6) | [1] 4 | (6) | [1] 8 |
| Quartz crystal (Brazilian pebble)—pounds | [2] 932,075 | [1] [2] 1,429 | 1,166,460 | 1,249 |
| Salt | 185,653 | [1] [2] 1,162 | 368,212 | [1] 2,354 |
| Sand and gravel: | | | | |
| Glass sand | 170 | 172 | 478 | 393 |
| Other sand | 317,947 | [1] 385 | 332,031 | [1] 454 |
| Gravel | 1,680 | (18) | 179 | (18) |
| Sodium sulfate | 124,474 | 2,530 | 103,249 | 2,174 |
| Stone | (6) | [1] 5,579 | (6) | 7,609 |
| Strontium: Mineral | 6,125 | 128 | 9,439 | 192 |
| Sulfur and pyrites: | | | | |
| Sulfur: | | | | |
| Ore—long tons | 24,152 | 595 | 14,750 | 359 |
| Other forms, n. e. s.—do | [2] 10,475 | [2] 264 | 188,550 | 4,975 |
| Pyrites—do | [2] 80,305 | [1] [2] 520 | [2] 73,296 | [1] [2] 480 |
| Talc: Unmanufactured | 29,079 | [1] 986 | 23,351 | [1] 749 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 8.—Principal minerals imported for consumption in the United States, 1955–56—Continued**

| Minera | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| COAL, PETROLEUM, AND RELATED PRODUCTS | | | | |
| Asphalt and related bitumen | 4,988 | 116 | 4,116 | 99 |
| Carbon black: | | | | |
| Acetylene black, pounds | 8,097,358 | [1] 1,331 | 8,373,224 | 1,383 |
| Gas black and carbon black, do | 53,600 | 11 | 69,890 | [1] 8 |
| Coal: | | | | |
| Anthracite | 170 | 1 | 46 | ([2]) |
| Bituminous, slack, culm, and lignite | 337,145 | [1] 2,640 | 355,701 | [1] 2,885 |
| Briquets | | | 318 | 4 |
| Coke | 126,342 | [1] 1,405 | 130,955 | [1] 1,471 |
| Peat: | | | | |
| Fertilizer grade | 217,624 | [1] 8,683 | 233,394 | [1] 9,764 |
| Poultry and stable grade | 11,686 | [1] 579 | 14,295 | [1] 766 |
| Petroleum: | | | | |
| Crude, thousand barrels | [3] 294,096 | [3] 654,787 | 354,727 | [1] 837,686 |
| Gasoline [4], do | [3] 5,348 | [1 3] 27,317 | 9,311 | [1] 40,506 |
| Kerosine, do | 44 | 166 | 231 | [1] 896 |
| Distillate oil [5], do | 5,089 | [1] 15,550 | 5,572 | [1] 17,908 |
| Residual oil [6], do | [3] 155,458 | [1 3] 305,456 | 165,761 | 366,458 |
| Unfinished oils, do | 6,616 | 15,540 | 4,561 | 12,499 |
| Asphalt (liquid and solid), do | 3,324 | 7,571 | 3,602 | 8,768 |
| Miscellaneous, do | ([2]) | [1] 36 | ([2]) | [1] 34 |

[1] Owing to changes in tabulating procedures by the Bureau of the Census data known to be not comparable with years before 1954.
[2] Revised figure.
[3] Adjusted by Bureau of Mines.
[4] Data not available.
[5] Less than 1,000.
[6] Weight not recorded.
[7] Includes 92,504 pounds of concentrate containing 29,804 pounds of vanadium, valued at $16,811, received but not reported by the Bureau of the Census until 1956.
[8] In addition to data shown an estimated 277,860 long tons ($711,740) were imported in 1955 and 292,520 long tons ($865,020) in 1956.
[9] Includes naphtha but excludes benzol: 1955—764,000 barrels ($7,168,000); 1956—1,666,000 barrels ($17,813,000).
[10] Includes quantities imported free of duty for supplies of vessels and aircraft.
[11] Includes quantities imported free for manufacture in bond and export, and for supplies of vessels and aircraft.

Digitized by Google

## TABLE 9.—Principle minerals and products exported from the United States, 1955–56

[Compiled by Mae B. Price and Elsie D. Page, Division of Foreign Activities, Bureau of Mines, from records of the Bureau of the Census]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| **METALS** | | | | |
| Aluminum: | | | | |
| Ingots, slabs, crude | 5,969 | 2,773 | 34,563 | 19,078 |
| Scrap | 18,290 | 6,501 | 19,329 | 8,127 |
| Plates, sheets, bars, etc | 8,009 | 7,518 | 12,493 | 13,093 |
| Castings and forgings | 1,139 | 2,425 | 1,247 | 3,094 |
| Antimony: Metals and alloys, crude | 204 | 71 | 33 | 24 |
| Arsenic: Calcium arsenate—pounds | 1,885,582 | 115 | 628,020 | 52 |
| Bauxite, including bauxite concentrates—long tons | 14,117 | 528 | 14,921 | 834 |
| Aluminum sulfate | 19,594 | 733 | 16,130 | 583 |
| Other aluminum compounds | 8,497 | 1,974 | 22,452 | 3,183 |
| Beryllium—pounds | 36,124 | 155 | 89,558 | 260 |
| Bismuth: | | | | |
| Metals and alloys—do | 203,667 | 363 | 287,092 | 559 |
| Salts and compounds—do | 59,638 | 218 | 51,251 | 182 |
| Cadmium—do | 1,393,915 | 1,938 | 1,284,248 | 1,932 |
| Calcium chloride | 20,743 | 608 | 32,523 | 1,057 |
| Chrome: | | | | |
| Ore and concentrates: | | | | |
| Exports | 1,341 | 76 | 1,727 | 99 |
| Reexports | 2,950 | 87 | 12,990 | 502 |
| Chromic acid | 701 | 374 | 637 | 351 |
| Ferrochrome | 4,693 | 2,267 | 5,538 | 2,891 |
| Cobalt—pounds | 3,823,167 | 1,231 | 3,025,142 | 1,820 |
| Columbium metals, alloys, and other forms—do | 6,370 | 10 | 10,500 | 9 |
| Copper: | | | | |
| Ores, concentrates, composition metal, and unrefined copper (copper content) | [1] 12,897 | [1] 9,479 | 13,717 | 11,648 |
| Refined copper and semimanufactures | 259,942 | 207,742 | 280,575 | 253,615 |
| Other copper manufactures | 234 | 309 | 185 | 291 |
| Copper sulfate or blue vitriol | 37,382 | 8,382 | 30,177 | 8,036 |
| Copper base alloys | (2) | 46,976 | (2) | 54,847 |
| Ferroalloys: | | | | |
| Ferrosilicon—pounds | 3,377,349 | 308 | 4,229,074 | 483 |
| Ferrophosphorus—do | 106,109,167 | 1,346 | 150,821,010 | 2,339 |
| Gold: | | | | |
| Ore and base bullion—troy ounces | 11,206 | 392 | 19,962 | 710 |
| Bullion, refined—do | 151,008 | 6,561 | 713,900 | 25,851 |
| Iron ore—long tons | 4,516,828 | 36,993 | 5,491,246 | 48,646 |
| Iron and steel: | | | | |
| Pig iron | 34,989 | 1,918 | 267,175 | 14,872 |
| Iron and steel products (major): | | | | |
| Semimanufactures | [1] 3,315,683 | [1] 483,367 | 3,025,957 | 496,544 |
| Manufactured steel mill products | [1] 1,124,299 | [1] 255,278 | 1,721,222 | 395,422 |
| Advanced products | (2) | [1] 144,473 | (2) | 167,004 |
| Iron and steel scrap: Ferrous scrap, including rerolling materials | [1] 5,171,774 | [1] 178,560 | 6,404,140 | 298,489 |
| Lead: | | | | |
| Ore, matte, base bullion (lead content) | [1] 1,334 | [1] 408 | 1,055 | 340 |
| Pigs, bars, anodes | 403 | 154 | 4,628 | 1,300 |
| Scrap | 2,983 | 1,340 | 2,136 | 578 |
| Magnesium: | | | | |
| Metal and alloys | [1] 8,230 | [1] 4,556 | 3,388 | 2,240 |
| Semifabricated forms, n. e. c | 236 | 515 | 487 | 902 |
| Powder | 14 | 34 | 56 | 99 |
| Manganese: | | | | |
| Ore and concentrates | 6,279 | 612 | 6,133 | 664 |
| Ferromanganese | 1,789 | 643 | 2,248 | 682 |
| Mercury: | | | | |
| Exports—76 pound flasks | 451 | 155 | 1,080 | 284 |
| Reexports—do | 267 | 78 | 2,025 | 476 |
| Molybdenum: | | | | |
| Ores and concentrates—pounds | 14,580,358 | 15,783 | 17,981,007 | 21,296 |
| Metals and alloys, crude and scrap—do | 22,564 | 19 | 35,240 | 21 |
| Wire—do | 11,482 | 177 | 11,440 | 202 |
| Semifabricated forms, n. e. c—do | 3,952 | 12 | 4,853 | 28 |
| Powder—do | 21,173 | 57 | 20,735 | 44 |
| Ferromolybdenum—do | 349,193 | 353 | 944,671 | 1,052 |

See footnotes at end of table.

Digitized by Google

**TABLE 9.—Principal minerals and products exported from the United States 1955–56—Continued**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| **METALS** | | | | |
| Nickel: | | | | |
| Ore | ---------- | ---------- | 27,331 | 556 |
| Alloys and scrap (including Monel metal), ingots, bars, sheets, etc | 19,964 | 15,610 | 16,361 | 18,019 |
| Nickel-chrome electric resistance wire | 208 | 773 | 208 | 836 |
| Semifabricated forms, n. e. c | 429 | 1,481 | 626 | 1,878 |
| Platinum: | | | | |
| Bars, ingots, sheets, wire, sponge, and other forms including scrap, troy ounces | 17,073 | 1,306 | 23,823 | 2,383 |
| Palladium, rhodium, iridium, osmiridium, ruthenium and osmium metals and alloys, including scrap, do | 11,895 | 470 | 18,249 | 634 |
| Platinum-group manufactures except jewelry | (2) | [1] 1,209 | (2) | 2,489 |
| Radium metal (radium content), milligrams | 366 | 14 | ---------- | ---------- |
| Rare earths: | | | | |
| Cerium ores, metal and alloy, pounds | 19,296 | 75 | 23,784 | 79 |
| Lighter flints, do | 10,772 | 83 | 16,303 | 110 |
| Silver: | | | | |
| Ore and base bullion, troy ounces | 71,074 | 63 | 2,058,401 | 1,868 |
| Bullion, refined, do | 4,821,635 | 4,378 | 3,442,479 | 3,154 |
| Tantalum: | | | | |
| Ore, metal, and other forms, pounds | 3,390 | 107 | 3,647 | 115 |
| Powder, do | 594 | 25 | 6,080 | 245 |
| Tin: | | | | |
| Ingots, pigs, bars, etc: | | | | |
| Exports, long tons | 254 | 504 | 667 | 1,013 |
| Reexports, do | 853 | 1,748 | 451 | 1,018 |
| Tin scrap and other tin bearing material except tinplate scrap, do | 6,190 | 2,441 | 4,396 | 2,130 |
| Tin cans finished or unfinished, do | 26,490 | 11,517 | 30,502 | 13,245 |
| Tin compounds, pounds | 311,005 | 547 | 375,021 | 672 |
| Titanium: | | | | |
| Ores and concentrates | 1,143 | 194 | 1,838 | 312 |
| Sponge (including iodide titanium) and scrap | 10 | 36 | 14 | 60 |
| Intermediate mill shapes | 4 | 106 | 469 | 5,809 |
| Mill products u. e. c | 31 | 1,105 | 90 | 2,796 |
| Ferrotitanium | 245 | 65 | 364 | 148 |
| Dioxide and pigments | 54,353 | 18,333 | 64,766 | 25,137 |
| Tungsten: Ore and concentrates: | | | | |
| Exports | 34 | 65 | 117 | 225 |
| Reexports | 283 | 527 | 349 | 778 |
| Vanadium ore and concentrates (vanadium content), pounds | 1,729,103 | 3,768 | 1,789,634 | 3,899 |
| Zinc: | | | | |
| Ores and concentrates (zinc content) | ---------- | ---------- | 854 | 162 |
| Slabs, pigs or blocks | [1] 18,069 | [1] 4,175 | 8,813 | 2,465 |
| Sheets, plates, strips or other forms, n. e. c | 3,657 | 2,193 | 4,444 | 3,031 |
| Scrap (zinc content) | 21,612 | 2,250 | 14,921 | 1,540 |
| Dust | 445 | 162 | 372 | 136 |
| Semifabricated forms, n. e. c | 651 | 296 | 582 | 301 |
| Zirconium: | | | | |
| Ores and concentrates | 779 | 58 | 1,048 | 90 |
| Metals and alloys and other forms, pounds | 106,778 | 101 | 18,987 | 200 |
| **NONMETALLIC MINERALS** | | | | |
| Abrasives: | | | | |
| Grindstones and pulpstones, pounds | 904,683 | 85 | 859,231 | 64 |
| Diamond dust and powder, carats | 215,787 | 516 | 210,841 | 616 |
| Diamond grinding wheels, do | 180,405 | 850 | 187,438 | 948 |
| Other natural and artificial metallic abrasives and products | (2) | 23,409 | (2) | 25,217 |
| Asbestos: Unmanufactured: | | | | |
| Exports | 2,161 | 236 | 2,797 | 338 |
| Reexports | 626 | 31 | 153 | 37 |
| Boron: Boric acid, borates, crude and refined, pounds | 445,176,000 | 14,533 | 487,450,563 | 16,596 |
| Bromine, bromides, and bromates, do | 3,649,861 | 1,656 | 6,111,363 | 2,557 |
| Cement, 376-pound barrels | 1,795,448 | 7,067 | 1,973,221 | 7,250 |
| Clay: | | | | |
| Kaolin or china clay | 49,830 | 1,017 | 59,138 | 1,298 |
| Fire clay | 109,312 | 1,358 | 152,037 | 1,561 |
| Other clays | 247,397 | 8,515 | 299,641 | 9,717 |

See footnotes at end of table.

Digitized by Google

**TABLE 9.—Principal minerals and products exported from the United States, 1955–56—Continued**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| **NONMETALS—continued** | | | | |
| Cryolite | 173 | 54 | 213 | 58 |
| Fluorspar | 873 | 65 | 197 | 31 |
| Graphite: | | | | |
| Amorphous | 1,141 | 130 | 790 | 90 |
| Crystalline flake, lump, or chip | 141 | 48 | 147 | 47 |
| Natural, n. e. c | 112 | 22 | 125 | 24 |
| Gypsum: | | | | |
| Crude, calcined, crushed | 22,539 | 738 | 20,757 | 711 |
| Plasterboard, wallboard, and tile ..... square feet | 8,686,854 | 412 | 7,026,932 | 364 |
| Manufactures, n. e. c | (2) | 198 | (2) | 141 |
| Iodine, iodide, iodates ..... pounds | 243,686 | 357 | 505,274 | 750 |
| Kyanite and allied minerals | 1,716 | 87 | 1,331 | 63 |
| Lime | 82,461 | 1,464 | 82,737 | 1,546 |
| Mica: | | | | |
| Unmanufactured ..... pounds | 447,491 | 35 | 546,673 | 92 |
| Manufactured: | | | | |
| Ground or pulverized ..... do | 5,808,347 | 332 | 8,901,497 | 486 |
| Other ..... do | 372,548 | 1,340 | 343,159 | 1,139 |
| Mineral-earth pigments: Iron oxide, natural and manufactured | 4,744 | 894 | 5,071 | 909 |
| Nitrogen compounds (major) | 828,117 | 44,795 | 1,038,307 | 53,090 |
| Phosphate rock ..... long tons | [1] 2,267,648 | [1] 20,301 | 2,880,484 | 25,704 |
| Phosphatic fertilizers ..... do | [1] 381,537 | [1] 12,140 | 504,612 | 17,885 |
| Pigments and salts (lead and zinc): | | | | |
| Lead pigments | 2,774 | 998 | 3,000 | 1,116 |
| Zinc pigments | 4,541 | 1,073 | 4,135 | 1,087 |
| Lead salts | 540 | 215 | 1,282 | 576 |
| Potash: | | | | |
| Fertilizer | 222,499 | 7,959 | 390,716 | 13,705 |
| Chemical | 6,804 | 1,244 | 6,839 | 1,232 |
| Quartz crystal (raw) | (2) | 66 | (2) | 65 |
| Radioactive isotopes, etc | (2) | 1,288 | (2) | 906 |
| Salt: | | | | |
| Crude and refined | 407,131 | 3,023 | 336,320 | 2,464 |
| Shipments to noncontiguous Territories | 10,019 | 721 | 11,649 | 881 |
| Sodium and sodium compounds: | | | | |
| Sodium sulfate | 24,561 | 870 | 29,784 | 1,033 |
| Sodium carbonate | [1] 153,257 | [1] 4,933 | 239,743 | 8,151 |
| Stone: | | | | |
| Limestone, crushed, ground, broken | 936,766 | 1,149 | 1,060,560 | 1,359 |
| Marble and other building and monumental ..... cubic feet | 437,644 | 1,024 | 344,210 | 976 |
| Stone, crushed, ground, broken | 169,074 | 2,924 | 175,364 | 2,890 |
| Manufactures of stone | (2) | 394 | (2) | 377 |
| Sulfur: | | | | |
| Crude ..... long tons | [1] 1,600,951 | [1] 48,708 | 1,651,325 | 48,304 |
| Crushed, ground, flowers of ..... do | 34,701 | 2,454 | 24,006 | 1,775 |
| Talc: | | | | |
| Crude and ground | 35,230 | 859 | 42,333 | 1,009 |
| Manufactures, n. e. c | 135 | 102 | 69 | 74 |
| Powders—talcum (face and compact) | (2) | 1,246 | (2) | 1,371 |
| **COAL, PETROLEUM, AND RELATED PRODUCTS** | | | | |
| Asphalt and bitumen, natural: | | | | |
| Unmanufactured | 32,723 | 1,444 | 30,844 | 1,845 |
| Manufactures, n. e. c | (2) | 714 | (2) | 937 |
| Carbon black ..... thousand pounds | 454,181 | 40,735 | 425,328 | 36,105 |
| Coal: | | | | |
| Anthracite | 3,152,213 | 48,429 | 5,244,349 | 73,535 |
| Bituminous | [1] 51,277,256 | [1] 436,559 | 68,546,290 | 658,472 |
| Briquets | 106,294 | 1,564 | 107,452 | 1,716 |
| Coke | 530,505 | 8,238 | 655,717 | 11,468 |

See footnotes at end of table.

Digitized by Google

**TABLE 9.—Principal minerals and products exported from the United States, 1955–56—Continued**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value (thousand dollars) | Short tons (unless otherwise stated) | Value (thousand dollars) |
| **COAL, PETROLEUM, AND RELATED PRODUCTS—continued** | | | | |
| Petroleum: | | | | |
| Crude thousand barrels | [1] 11,570 | [1] 38,650 | 28,515 | 90,013 |
| Gasoline [2] do | [1] 25,992 | [1] 177,471 | 28,202 | 191,233 |
| Kerosene do | 2,497 | 10,215 | 2,876 | 12,323 |
| Distillate oil do | [1] 21,854 | [1] 80,068 | 31,820 | 121,740 |
| Residual oil do | [1] 27,725 | [1] 55,470 | 22,147 | 53,553 |
| Lubricating oil do | 13,663 | 188,933 | 13,217 | 193,579 |
| Asphalt do | 1,477 | 8,024 | 1,294 | 7,478 |
| Liquefied petroleum gases do | 4,231 | 15,649 | 4,274 | 16,214 |
| Wax do | 1,248 | 24,253 | 920 | 20,851 |
| Coke do | 4,463 | 15,647 | 6,376 | 20,323 |
| Petrolatum do | 330 | 6,304 | 307 | 6,195 |
| Miscellaneous products do | 830 | 16,310 | 851 | 16,967 |

[1] Revised figure.
[2] Weight not recorded.
[3] Includes naphtha but excludes benzol: 1955—59,000 barrels ($990,000); 1956—64,740 barrels ($1,114,968).

**TABLE 10.—Comparison of world and United States [1] production of principal metals and minerals, 1955–56**

[Compiled under the supervision of Berenice B. Mitchell, Division of Foreign Activities, Bureau of Mines]

| Mineral | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | World | United States | | World | United States | |
| | Thousand short tons | | Percent of world | Thousand short tons | | Percent of world |
| Coal: | | | | | | |
| Bituminous | 1,615,480 | 461,468 | 29 | 1,701,720 | 497,996 | 29 |
| Lignite | 592,720 | 3,166 | (2) | 624,680 | 2,878 | (2) |
| Pennsylvania anthracite | 144,600 | 26,205 | 18 | 155,700 | 28,900 | 19 |
| Coke (excluding breeze): | | | | | | |
| Gashouse [3] | 49,500 | (4) | (4) | 50,800 | 182 | (2) |
| Oven and beehive | 265,900 | 75,302 | 28 | 279,400 | 74,454 | 27 |
| Fuel briquets and packaged fuel | 114,600 | 1,699 | 1 | 118,400 | 1,584 | 1 |
| Natural gas million cubic feet | (4) | 9,405,351 | (2) | (4) | 10,081,923 | (2) |
| Peat | 65,580 | 274 | (2) | 58,340 | 292 | (2) |
| Petroleum (crude) thousand barrels | 5,626,225 | 2,484,428 | 44 | 6,125,425 | 2,617,283 | 43 |
| Nonmetals: | | | | | | |
| Asbestos | 1,730 | 45 | 3 | 1,705 | 41 | 2 |
| Barite | 2,600 | 1,114 | 43 | 3,000 | 1,352 | 45 |
| Cement thousand barrels | 1,275,100 | 314,913 | 25 | 1,379,900 | 333,472 | 24 |
| Corundum | 8 | | | 11 | | |
| Diamonds thousand carats | 17,500 | | | 18,300 | | |
| Feldspar [5] thousand long tons | 970 | 465 | 48 | 1,155 | 622 | 54 |
| Fluorspar | 1,460 | 280 | 19 | 1,720 | 330 | 19 |
| Graphite | 290 | (4) | (4) | 270 | (4) | (4) |
| Gypsum | 34,080 | 10,684 | 31 | 34,200 | 10,316 | 30 |
| Magnesite | 4,700 | 486 | 10 | 5,200 | 687 | 13 |
| Mica (including scrap) thousand pounds | 330,000 | 191,506 | 58 | 310,000 | 173,506 | 56 |
| Nitrogen, agricultural [6 7] | 6,945 | 1,998 | 29 | 7,496 | 2,240 | 30 |
| Phosphate rock thousand long tons | 29,800 | 12,265 | 41 | 33,500 | 15,747 | 47 |
| Potash $K_2O$ equivalent | 7,900 | 2,080 | 26 | 8,300 | 2,172 | 26 |
| Pumice | 3,800 | 1,804 | 47 | 3,600 | 1,482 | 41 |
| Pyrites thousand long tons | 16,000 | 1,007 | 6 | 16,300 | 1,070 | 7 |
| Salt | 68,000 | 22,704 | 33 | 70,700 | 24,216 | 34 |

See footnotes at end of table.

Digitized by Google

**TABLE 10.—Comparison of world and United States [1] production of principal metals and minerals, 1955–56—Continued**

| Mineral | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | World | United States | | World | United States | |
| | Thousand short tons | | Percent of world | Thousand short tons | | Percent of world |
| Nonmetals—Continued | | | | | | |
| Sulfur, native.....thousand long tons.. | 7,000 | 5,800 | 83 | 8,000 | 6,484 | 81 |
| Talc, pyrophyllite, and soapstone..... | 1,770 | 726 | 41 | 1,830 | 739 | 40 |
| Vermiculite [6]..... | 263 | 204 | 78 | 254 | 193 | 76 |
| Metals, mine basis: | | | | | | |
| Antimony (content of ore and concentrate) [6]..... | 51 | ([8]) | 1 | 54 | ([8]) | 1 |
| Arsenic [6]..... | 46 | 11 | 24 | 44 | 13 | 30 |
| Bauxite.....thousand long tons.. | 16,400 | 1,788 | 11 | 17,400 | 1,743 | 10 |
| Beryllium concentrates..... | 9 | ([9]) | 6 | 13 | ([9]) | 4 |
| Bismuth.....thousand pounds.. | 4,000 | ([4]) | ([4]) | 4,900 | ([4]) | ([4]) |
| Cadmium.....do.... | 17,900 | 9,754 | 54 | 19,020 | 10,414 | 55 |
| Chromite..... | 3,800 | 153 | 4 | 4,200 | 208 | 5 |
| Cobalt (contained).....short tons.. | 14,800 | 926 | 6 | 16,000 | 1,269 | 8 |
| Columbium-tantalum concentrates thousand pounds.. | 11,560 | 13 | ([3]) | 9,640 | 217 | 2 |
| Copper (content of ore and concentrate).. | 3,400 | 999 | 29 | 3,750 | 1,106 | 29 |
| Gold.....thousand fine ounces.. | 36,400 | 1,877 | 5 | 38,400 | 1,865 | 5 |
| Iron ore.....thousand long tons.. | 365,700 | 102,999 | 28 | 388,000 | 97,849 | 25 |
| Lead (content of ore and concentrate).... | 2,370 | 338 | 14 | 2,420 | 353 | 15 |
| Manganese ore (35 percent or more Mn).. | 11,715 | 287 | 2 | 12,145 | 345 | 3 |
| Mercury.....thousand 76-pound flasks.. | 185 | 19 | 10 | 197 | 24 | 12 |
| Molybdenum (content of ore and concentrate).....thousand pounds.. | 67,900 | 61,781 | 91 | 63,200 | 57,462 | 91 |
| Nickel (content of ore and concentrate).. | 215 | 4 | 2 | 231 | 7 | 3 |
| Platinum group (Pt, Pd, etc.) thousand troy ounces.. | 950 | 23 | 2 | 975 | 21 | 2 |
| Silver.....thousand fine ounces.. | 223,400 | 36,470 | 16 | 222,400 | 38,739 | 17 |
| Tin (content of ore and concentrate) [6] thousand long tons.. | 180 | ([10]) | ([3]) | 180 | ---------- | ---------- |
| Titanium concentrates: | | | | | | |
| Ilmenite..... | 1,405 | 583 | 41 | 1,789 | 685 | 38 |
| Rutile..... | 76 | 9 | 12 | 122 | 12 | 10 |
| Tungsten concentrate..60 percent $WO_3$ (short tons).. | 81,600 | 16,412 | 20 | 81,400 | 14,737 | 18 |
| Vanadium (content of ore and concentrate) [6].....(short tons).. | 4,004 | 3,286 | 82 | 4,236 | 3,868 | 91 |
| Zinc (content of ore and concentrate).... | 3,180 | 515 | 16 | 3,330 | 542 | 16 |
| Metals, smelter basis: | | | | | | |
| Aluminum..... | 3,470 | 1,566 | 45 | 3,710 | 1,679 | 45 |
| Copper..... | 3,640 | 1,107 | 30 | 3,955 | 1,231 | 31 |
| Iron, pig (incl. ferroalloys)..... | 212,200 | 79,263 | 37 | 222,300 | 77,667 | 35 |
| Lead..... | 2,220 | 479 | 22 | 2,370 | 542 | 23 |
| Magnesium..... | 143 | 61 | 43 | 157 | 68 | 43 |
| Steel ingots and castings..... | 297,700 | 117,036 | 39 | 312,700 | 115,216 | 37 |
| Tin.....thousand long tons.. | 181 | 22 | 12 | 181 | 18 | 10 |
| Zinc..... | 2,970 | 964 | 32 | 3,110 | 984 | 32 |

[1] Including Alaska and noncontiguous Territories.
[3] Less than one percent.
[4] Includes low- and medium-temperature and gashouse coke.
[6] Bureau of Mines not at liberty to publish United States figure separately.
[8] Data not available.
[6] World total exclusive of U. S. S. R.
[7] Year ended June 30 of year stated (United Nations).
[8] In 1955 United States production of antimony was 633 short tons, and 590 short tons in 1956.
[9] In 1955 United States production of beryl was 500 short tons, and 460 short tons in 1956.
[10] In 1955 United States production of tin was 99 long tons.

Digitized by Google

# Employment and Injuries in the Mineral Industries

By John C. Machisak[1]

THIS CHAPTER of the Minerals Yearbook (volume III) contains overall injury experience and employment data at bituminous-coal, lignite, and anthracite mines, coking plants, metal and nonmetal mines, metallurgical plants, and stone quarries in the United States for the calendar year 1956. Volume I of the Yearbook includes injury experiences and related employment data in the metal, nonmetal, and quarrying industries, and in the milling operations connected with the mining of those commodities. Volume II contains the injury and related employment experience of the coal mining, coking, and oil and gas industries.

Reporting is voluntary on the surveys conducted by the Bureau of Mines to collect injury and employment data in the mineral industries, except in the coal-mining industry, where operators are required by Federal law to furnish the information requested.

These figures may not be complete for all the mineral industries; however, every effort has been made to make the coverage complete, and it is believed that the data presented here represent the hazards to which workers in these industries were exposed.

Employment in the mineral industries declined 4 percent in 1956. Reports from operators revealed an average employment of 471,386 men in 1956 and 489,064 in 1955. The number of days worked per man per year increased slightly, although the man-days and man-hours decreased approximately 1 percent. The length of shift worked per day in 1956 averaged 7.98 hours, compared with 7.97 in 1955. The average employee worked 1,995 hours in 1956 and 1,944 hours in 1955, an approximate increase of 3 percent.

The average injury-frequency rate in the mineral industries was most favorable in 1956, with an approximate 5-percent decrease in the total number. Fourteen more fatal injuries were reported in 1956 than in 1955, or 603 and 589, respectively. The overall injury-frequency rate (fatal and nonfatal combined) showed a reduction of 4 percent.

The fatal rate for 1956 was 0.64 per million man-hours of work; for 1955, a comparable rate of 0.62 was reported.

The number of nonfatal injuries reported for 1956 was 31,034, with a frequency rate of 33.00. In 1955, 32,861 nonfatal injuries were reported, with a frequency rate of 34.57.

No major disaster (a single accident in which 5 or more men are killed) occurred in the mineral industries in 1956.

[1] Acting chief, Branch of Accident Analysis, Division of Safety.



Digitized by Google

**TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1952–56, by industry groups.**

| | 1952 | 1953 | 1954 | 1955 [1] | 1956 [1] |
|---|---|---|---|---|---|
| Average number of men working daily: [2] | | | | | |
| Coal mines | 401,329 | 351,126 | 283,705 | 258,003 | 238,693 |
| Metal mines | 74,626 | 72,529 | 66,610 | 62,744 | 57,739 |
| Nonmetal mines (except stone quarries) [3] | 12,447 | 12,765 | 12,810 | 13,740 | 14,681 |
| Stone quarries | 81,879 | 83,641 | 78,910 | 75,980 | 78,701 |
| Coke plants | 25,241 | 23,440 | 19,209 | 20,681 | 20,205 |
| Metallurgical plants | 49,032 | 55,283 | 54,396 | 49,892 | 44,097 |
| Nonmetal mills [4] | | | | 8,024 | 16,670 |
| Total | 644,554 | 598,784 | 515,640 | 489,064 | 471,386 |
| Average number of active mine-days: | | | | | |
| Coal mines | 189 | 187 | 175 | 207 | 216 |
| Metal mines | 265 | 270 | 245 | 264 | 262 |
| Nonmetal mines (except stone quarries) [3] | 288 | 292 | 284 | 267 | 271 |
| Stone quarries | 279 | 278 | 273 | 275 | 272 |
| Coke plants | 315 | 345 | 342 | 352 | 347 |
| Metallurgical plants | 319 | 318 | 307 | 309 | 313 |
| Nonmetal mills [4] | | | | 282 | 279 |
| Total | 226 | 230 | 222 | 244 | 250 |
| Man-days worked, in thousands: | | | | | |
| Coal mines | 76,003 | 65,688 | 49,598 | 53,278 | 51,579 |
| Metal mines | 19,770 | 19,559 | 16,294 | 16,550 | 15,118 |
| Nonmetal mines (except stone quarries) [3] | 3,588 | 3,727 | 3,637 | 3,669 | 3,980 |
| Stone quarries | 22,844 | 23,248 | 21,506 | 20,864 | 21,439 |
| Coke plants | 7,939 | 8,086 | 6,567 | 7,279 | 7,017 |
| Metallurgical plants | 15,628 | 17,603 | 16,713 | 15,416 | 13,999 |
| Nonmetal mills [4] | | | | 2,264 | 4,648 |
| Total | 145,772 | 137,911 | 114,315 | 119,320 | 117,780 |
| Man-hours worked, in thousands: | | | | | |
| Coal mines | 593,698 | 513,594 | 387,950 | 417,473 | 404,723 |
| Metal mines | 158,649 | 156,605 | 130,489 | 132,317 | 121,259 |
| Nonmetal mines (except stone quarries) [3] | 28,955 | 30,488 | 29,564 | 29,733 | 32,351 |
| Stone quarries | 186,552 | 189,776 | 175,817 | 170,808 | 175,424 |
| Coke plants | 62,803 | 64,677 | 52,482 | 58,164 | 56,038 |
| Metallurgical plants | 124,967 | 138,811 | 133,675 | 123,524 | 111,981 |
| Nonmetal mills [4] | | | | 18,537 | 38,616 |
| Total | 1,155,624 | 1,093,951 | 909,977 | 950,556 | 940,392 |
| Number of injuries: | | | | | |
| Fatal: | | | | | |
| Coal mines | 548 | 461 | 396 | 417 | 445 |
| Metal mines | 117 | 92 | 86 | 79 | 67 |
| Nonmetal mines (except stone quarries) [3] | 14 | 22 | 9 | 18 | 14 |
| Stone quarries | 74 | 43 | 34 | 53 | 49 |
| Coke plants | 8 | 8 | 8 | 9 | 9 |
| Metallurgical plants | 16 | 12 | 16 | 10 | 13 |
| Nonmetal mills [4] | | | | 3 | 6 |
| Total | 777 | 638 | 549 | 589 | 603 |
| Nonfatal: | | | | | |
| Coal mines | 30,074 | 24,258 | 17,718 | 19,013 | 18,934 |
| Metal mines | 6,684 | 6,164 | 4,994 | 5,795 | 4,443 |
| Nonmetal mines (except stone quarries) [3] | 1,171 | 1,419 | 956 | 1,155 | 915 |
| Stone quarries | 4,503 | 4,450 | 3,834 | 3,778 | 3,701 |
| Coke plants | 546 | 425 | 254 | 325 | 302 |
| Metallurgical plants | 2,853 | 2,824 | 2,578 | 2,346 | 1,755 |
| Nonmetal mills [4] | | | | 449 | 984 |
| Total | 45,831 | 39,540 | 30,334 | 32,861 | 31,034 |

See footnotes at end of table.

Digitized by Google

**TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1952–56, by industry groups—Continued**

| | 1952 | 1953 | 1954 | 1955 [1] | 1956 [1] |
|---|---|---|---|---|---|
| Injury rates per million man-hours: | | | | | |
| Fatal: | | | | | |
| Coal mines | 0.92 | 0.90 | 1.02 | 1.00 | 1.10 |
| Metal mines | .74 | .59 | .66 | .60 | .55 |
| Nonmetal mines (except stone quarries) [2] | .48 | .72 | .30 | .61 | .43 |
| Stone quarries | .40 | .23 | .19 | .31 | .28 |
| Coke plants | .13 | .12 | .15 | .15 | .16 |
| Metallurgical plants | .13 | .09 | .12 | .08 | .12 |
| Nonmetal mills [4] | | | | .16 | .16 |
| Total | .67 | 58 | .60 | .62 | .64 |
| Nonfatal: | | | | | |
| Coal mines | 50.66 | 47.23 | 45.67 | 45.54 | 46.78 |
| Metal mines | 42.13 | 39.36 | 38.27 | 43.80 | 36.64 |
| Nonmetal mines (except stone quarries) [3] | 40.44 | 46.54 | 32.34 | 38.85 | 28.28 |
| Stone quarries | 24.14 | 23.45 | 21.81 | 22.12 | 21.10 |
| Coke plants | 8.69 | 6.57 | 4.84 | 5.59 | 5.39 |
| Metallurgical plants | 22.83 | 20.34 | 19.29 | 18.99 | 15.67 |
| Nonmetal mills [4] | | | | 24.22 | 25.48 |
| Total | 39.66 | 36.14 | 33.33 | 34.57 | 33.00 |

[1] Preliminary figures.
[2] Men at work each day mine was active.
[3] Clay mines included beginning with 1955.
[4] Not previously shown separately.

**Work Stoppages.**—In 1956, according to the Bureau of Labor Statistics, 349 work stoppages occurred in the mineral industries. Most of these stoppages (266) were in the bituminous-coal industry, where 377,000 man-days of work was lost. The anthracite industry lost 56,000 man-days from 18 work stoppages during the year. The metal-mining industry, with 16 stoppages, and nonmetal mining and quarrying, with 23 stoppages, lost 812,000 and 75,000 man-days, respectively. The remaining 26 work stoppages occurred as follows: Cement plants, 14; coke and byproduct plants, 3; and petroleum refineries, 9—an overall loss of 214,000 additional man-days. There were 10 fewer work stoppages in the mineral industries in 1956 than in 1955, with approximately 400,000 more man-days lost or an increase of 36 percent over 1955.

**Average Earnings.**—Increased average hourly earnings were reported in all mineral industries for 1956, an overall increase of 6 percent.

**Labor Turnover.**—Accession rates were lower in all industries, according to a report issued by the Bureau of Labor Statistics. Declines were also reported in separation rates, except in the iron and cement-industry groups, where increases were noted.

Digitized by Google

**TABLE 2.—Work stoppages, average earnings, and labor turnover in certain mineral industries in the United States, 1952–56**

[U. S. Department of Labor]

| Industry and year | Work stoppages | | Average earnings [1] | | Labor-turnover rates [2] | |
|---|---|---|---|---|---|---|
| | Number | Man-days lost (thousand) | Weekly | Hourly | Accession | Separation |
| Coal mining: | | | | | | |
| Anthracite: | | | | | | |
| 1952 | 41 | 104 | 71.19 | 2.26 | 1.4 | 2.2 |
| 1953 | 24 | 108 | 72.91 | 2.48 | 1.4 | 3.1 |
| 1954 | 19 | 76 | [3] 75.05 | 2.51 | 1.3 | 3.2 |
| 1955 | 17 | 9 | 84.50 | 2.53 | 1.8 | 4.5 |
| 1956 | 18 | 56 | 87.58 | 2.63 | (4) | (4) |
| Bituminous: | | | | | | |
| 1952 | 560 | 2,760 | 78.09 | 2.29 | 1.9 | 2.8 |
| 1953 | 392 | 418 | 85.31 | 2.48 | 1.3 | 2.6 |
| 1954 | 208 | 344 | 80.85 | 2.48 | 1.2 | 3.2 |
| 1955 | 292 | 273 | 96.28 | 2.56 | 1.6 | 1.5 |
| 1956 | 266 | 377 | 105.94 | 2.81 | .8 | .6 |
| Metal mining: | | | | | | |
| 1952 | 29 | 1,300 | 81.65 | 1.86 | 5.8 | 5.7 |
| 1953 | 15 | 255 | 88.54 | 2.04 | 4.3 | 4.7 |
| 1954 | 9 | 392 | 84.46 | 2.07 | 3.2 | 4.1 |
| 1955 | 19 | 638 | 92.42 | 2.19 | 4.5 | 3.9 |
| 1956 | 16 | 812 | 97.52 | 2.30 | 1.5 | 2.9 |
| Iron: | | | | | | |
| 1952 | (4) | (4) | 80.34 | 1.83 | 2.9 | 2.9 |
| 1953 | (4) | (4) | 90.74 | 2.14 | 1.9 | 2.1 |
| 1954 | (4) | (4) | 82.03 | 2.17 | 1.6 | 4.3 |
| 1955 | (4) | (4) | 92.46 | 2.30 | 2.8 | 1.6 |
| 1956 | (4) | (4) | 97.44 | 2.43 | .6 | 3.1 |
| Copper: | | | | | | |
| 1952 | (4) | (4) | 85.73 | 1.88 | 5.4 | 5.1 |
| 1953 | (4) | (4) | 91.60 | 2.00 | 4.8 | 4.8 |
| 1954 | (4) | (4) | [3] 87.13 | 2.05 | 3.6 | 3.9 |
| 1955 | (4) | (4) | 95.70 | 2.17 | 5.2 | 4.5 |
| 1956 | (4) | (4) | 100.95 | 2.31 | 1.6 | 1.7 |
| Lead-zinc: | | | | | | |
| 1952 | (4) | (4) | 81.60 | 1.92 | 4.4 | 4.5 |
| 1953 | (4) | (4) | 80.06 | 1.92 | 2.7 | 4.9 |
| 1954 | (4) | (4) | [3] 76.92 | 1.89 | 2.1 | 2.2 |
| 1955 | (4) | (4) | 83.82 | 2.01 | 2.5 | 2.1 |
| 1956 | (4) | (4) | 89.67 | 2.13 | 1.6 | 1.4 |
| Nonmetal mining and quarrying: | | | | | | |
| 1952 | 17 | 94 | 71.10 | 1.58 | (4) | (4) |
| 1953 | 26 | 63 | 73.99 | 1.70 | (4) | (4) |
| 1954 | 14 | 33 | 77.44 | 1.76 | (4) | (4) |
| 1955 | 18 | 164 | 80.99 | 1.82 | (4) | (4) |
| 1956 | 23 | 75 | 85.63 | 1.92 | (4) | (4) |
| Cement: | | | | | | |
| 1952 | (4) | (4) | 67.72 | 1.62 | 2.7 | 2.6 |
| 1953 | 5 | 20 | 73.39 | 1.76 | 2.5 | 2.6 |
| 1954 | 20 | 113 | 73.71 | 1.82 | 1.6 | 1.5 |
| 1955 | 4 | 4 | 78.85 | 1.90 | 2.0 | 1.7 |
| 1956 | 14 | 68 | 84.04 | 2.03 | .4 | 1.8 |
| Coke and byproducts: | | | | | | |
| 1952 | (4) | (4) | 73.74 | 1.76 | (4) | (4) |
| 1953 | 2 | 1 | 78.51 | 1.89 | (4) | (4) |
| 1954 | 1 | 7 | [3] 80.93 | 1.95 | (4) | (4) |
| 1955 | 1 | (5) | 86.31 | 2.06 | (4) | (4) |
| 1956 | 3 | 56 | 90.91 | 2.18 | (4) | (4) |
| Petroleum refining: | | | | | | |
| 1952 | 4 | 46 | 88.44 | 2.20 | 1.0 | .8 |
| 1953 | 9 | 50 | 94.19 | 2.32 | .8 | .9 |
| 1954 | 10 | 36 | 96.22 | 2.37 | .5 | .7 |
| 1955 | 8 | 43 | 100.37 | 2.46 | .7 | .8 |
| 1956 | 9 | 90 | 108.39 | 2.63 | .6 | .6 |

[illegible] and related industries only.
[illegible] as the number per 100 employees.
[illegible].
[illegible].
Less than 1,000 man-days.

Digitized by Google

## NATIONAL SAFETY COMPETITION

Safety competitions, sponsored and conducted annually by the Bureau of Mines, have proved effective in promoting accident-prevention work in the mineral industries. An encouraging number of mineral plants (679) enrolled in the National Safety Competition and the National Sand and Gravel Competition and reported outstanding safety records in 1956. Of the operations enrolled in these 2 contests, 274 (40 percent) attained injury-free records. The aggregate worktime of these injury-free operations was a little less than 23 million man-hours or 17 percent of the total time worked at all participating plants in these 2 national competitions. The man-hours worked in 1956 totaled 135,674,880. In addition, the Bureau of Mines conducted three other competitions, sponsored annually by national associations connected with the mineral industries. These associations were: National Lime, National Crushed Stone, and National Slag. In these contests, of the 167 plants enrolled in 1956, 71 (42.5 percent) had injury-free records during an aggregate worktime of more than 21 million man-hours.

Trophy awards for the best safety record in each of these six groups of the 1956 National Safety Competition were made to the following:

**Anthracite Underground Mines.**—Goodspring mine, Penag Coal Co., Goodspring, Pa.

**TABLE 3.—Employment and injury experience of the United States mineral industries, 1931–56**

| Year | Men working daily | Average active days | Man-days worked | Man-hours worked | Number of injuries | | Injury rates per million man-hours | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Fatal | Nonfatal | Fatal | Nonfatal |
| 1931 | 784,347 | 188 | 147,602,799 | 1,288,125,808 | 1,707 | 94,021 | 1.33 | 72.99 |
| 1932 | 671,343 | 165 | 110,655,616 | 962,924,915 | 1,368 | 66,028 | 1.42 | 68.57 |
| 1933 | 677,722 | 181 | 122,787,558 | 1,058,245,650 | 1,242 | 70,158 | 1.17 | 66.30 |
| 1934 | 739,817 | 195 | 144,566,133 | 1,167,723,543 | 1,429 | 79,211 | 1.22 | 67.83 |
| 1935 | 783,139 | 196 | 152,354,170 | 1,215,816,764 | 1,495 | 80,070 | 1.23 | 65.88 |
| 1936 | 824,514 | 216 | 177,920,334 | 1,426,233,543 | 1,686 | 90,608 | 1.18 | 63.53 |
| 1937 | 859,951 | 217 | 186,790,283 | 1,482,241,908 | 1,759 | 94,466 | 1.19 | 63.73 |
| 1938 | 774,894 | 187 | 145,056,875 | 1,144,137,296 | 1,369 | 69,940 | 1.20 | 61.13 |
| 1939 | 788,925 | 202 | 159,388,490 | 1,251,169,210 | 1,334 | 73,253 | 1.07 | 58.55 |
| 1940 | 801,926 | 219 | 175,663,792 | 1,385,128,234 | 1,716 | 80,856 | 1.24 | 58.37 |
| 1941 | 835,095 | 224 | 195,425,228 | 1,541,335,277 | 1,621 | 87,911 | 1.05 | 57.04 |
| 1942 | 802,640 | 260 | 208,739,906 | 1,653,284,620 | 1,862 | 91,675 | 1.13 | 55.45 |
| 1943 | 747,486 | 277 | 207,350,643 | 1,668,340,394 | 1,799 | 88,449 | 1.08 | 53.02 |
| 1944 | 676,938 | 287 | 194,512,359 | 1,618,479,042 | 1,571 | 83,451 | .97 | 51.56 |
| 1945 | 637,220 | 271 | 172,672,431 | 1,437,533,530 | 1,270 | 73,411 | .88 | 51.07 |
| 1946 | 676,254 | 240 | 162,630,674 | 1,354,822,190 | 1,167 | 72,805 | .86 | 53.74 |
| 1947 | 721,792 | 256 | 185,076,018 | 1,496,101,097 | 1,407 | 76,919 | .94 | 51.41 |
| 1948 | 740,988 | 249 | 184,551,937 | 1,457,690,518 | 1,227 | 70,939 | .84 | 48.67 |
| 1949 | 723,390 | 205 | 148,304,347 | 1,170,500,880 | 760 | 51,576 | .65 | 44.06 |
| 1950 | 719,863 | 221 | 159,443,478 | 1,259,436,140 | 843 | 53,229 | .67 | 42.26 |
| 1951 | 684,544 | 235 | 160,558,417 | 1,270,186,435 | 980 | 52,155 | .77 | 41.06 |
| 1952 | 644,554 | 226 | 145,771,805 | 1,155,622,605 | 777 | 45,831 | .67 | 39.66 |
| 1953 | 598,784 | 230 | 137,910,860 | 1,093,950,835 | 638 | 39,540 | .58 | 36.14 |
| 1954 | 515,640 | 222 | 114,314,878 | 909,977,122 | 549 | 30,334 | .60 | 33.33 |
| 1955 [1] | 489,064 | 244 | 119,319,952 | 950,556,247 | 589 | 32,861 | .62 | 34.57 |
| 1956 [1] | 471,386 | 250 | 117,780,478 | 940,391,527 | 603 | 31,034 | .64 | 33.00 |

[1] Preliminary figures.



Digitized by Google

**Bituminous-Coal Underground Mines.**—Edgewater mine, Tennessee Coal and Iron Division, United States Steel Corp., Wylam, Ala.

**Metal Underground Mines.**—Buck mine, Pickands Mather & Co., (Verona Mining Co.), Caspian, Mich.

**Nonmetal Underground Mines.**—Bell mine, Warner Co., Bellefonte Division, Bellefonte, Pa.

**Open-Pit Mines.**—Embarrass mine, Pickands Mather & Co. (Lake Mining Co.), Biwabik, Minn.

**Quarries.**—Alpena quarry, Wyandotte Chemicals Corp., Alpena, Mich.

Digitized by Google

# The Mineral Industry of Alabama

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Alabama.**

By Avery H. Reed, Jr.,[1] and Walter B. Jones[2]

RECORD production of cement, clays, salt, sand and gravel, and stone highlighted the mineral industry of the State in 1956. Coal and iron-ore production declined owing to increased imports of foreign iron ore and decreased demand for metallurgical coke. Alabama ranked second in production of bauxite and of native asphalt, and third in output of iron ore.

New developments in the State included the Citronelle oilfield and its 97 wells, which more than doubled the total production of petroleum compared with 1955. There is no question about the impetus that field has given to the oil and gas industry in Alabama, now 13 years old. The State's 4 oilfields are in southwest Alabama and its 1 gasfield is in Marion County, in the Warrior coal basin.

**TABLE 1.—Mineral production in Alabama, 1955–56[1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated | Value |
| Cement: | | | | |
| Masonry ..... 376-pound barrels | 1,938,520 | $6,832,671 | 1,753,201 | $6,584,774 |
| Portland ..... do | 11,782,095 | 31,517,373 | 12,311,520 | 35,255,585 |
| Clays | (2) | (2) | [3] 1,594,159 | [3] 2,146,680 |
| Coal | 13,088,477 | 79,337,006 | 12,663,344 | 79,322,439 |
| Iron ore (usable) ..... long tons, gross weight | 6,813,670 | 44,657,215 | 5,632,708 | 34,824,465 |
| Lime | 462,194 | 5,185,706 | 466,399 | 5,088,695 |
| Mica (sheet) ..... pounds | (2) | (2) | 1,122 | 6,812 |
| Natural gas ..... million cubic feet | 282 | 20,000 | 42 | 3,000 |
| Petroleum (crude) ..... thousand 42-gallon barrels | 1,411 | 2,910,000 | 3,069 | 7,335,000 |
| Sand and gravel | 3,680,173 | 3,523,524 | 4,998,888 | 4,621,469 |
| Stone | 8,269,355 | 11,867,191 | [4]12,342,635 | [4] 14,702,153 |
| Talc | 1,500 | 8,000 | 2,200 | 4,500 |
| Value of items that cannot be disclosed: Asphalt (native), bauxite, pozzolan cement, mica (scrap), salt, stone (dimension limestone and dimension marble, 1956), and values indicated by footnote 2 | ----- | 4,325,207 | ----- | 4,083,161 |
| Total Alabama [5] | ----- | 186,453,000 | ----- | 189,186,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Excludes kaolin; value included with "Items that cannot be disclosed."
[4] Incomplete figure; excludes dimension limestone and dimension marble.
[5] The total has been adjusted to eliminate duplications in the value of clays and stone.

[1] Chief, Field Office, Region V, Bureau of Mines, Knoxville, Tenn.
[2] State geologist, Alabama Geological Survey, Tuscaloosa, Ala.



Digitized by Google

**TABLE 2.—Average unit value of minerals produced in Alabama, 1947–51 (average) and 1952–56 [1]**

| Mineral | | 1947–51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|
| Bauxite | long dry ton | $5.82 | $6.20 | $7.31 | $6.50 | $6.31 | $10.51 |
| Cement: | | | | | | | |
| Portland | 376-pound barrel | 2.09 | 2.36 | 2.46 | 2.57 | 2.68 | 2.86 |
| Masonry | do | (2) | (2) | (2) | (2) | 3.52 | 3.76 |
| Pozzolan | do | 3.02 | 2.96 | 3.16 | 3.30 | 2.90 | 3.16 |
| Clays: | | | | | | | |
| Fire | short ton | 2.24 | 3.44 | 2.88 | 4.18 | 5.10 | 3.26 |
| Kaolin | do | 8.38 | 5.00 | 9.67 | 9.94 | 10.45 | 10.49 |
| Miscellaneous | do | .75 | 1.07 | .99 | 1.04 | .90 | .90 |
| Coal | do | 5.99 | 6.22 | 6.33 | 6.23 | 6.06 | 6.26 |
| Graphite | do | 88.16 | 117.92 | ---- | ---- | ---- | ---- |
| Iron ore: | | | | | | | |
| Hematite | long ton | 3.67 | 5.16 | 7.70 | 5.74 | 6.86 | 6.49 |
| Limonite | do | 3.21 | 5.71 | 5.35 | 5.12 | 4.70 | 5.23 |
| Lime | short ton | 8.82 | 10.51 | 10.66 | 10.64 | 11.22 | 10.91 |
| Mica: | | | | | | | |
| Scrap | do | ---- | 16.55 | ---- | 20.00 | 21.10 | 27.00 |
| Sheet | pound | ---- | 1.41 | 6.09 | 2.75 | 14.44 | 6.07 |
| Natural gas | million cubic feet | 50.00 | 40.00 | 48.78 | 60.00 | 70.92 | 71.43 |
| Oystershell | short ton | (3) | (2) | (2) | (2) | (3) | 1.27 |
| Petroleum | 42-gallon barrel | (2) | 2.02 | 1.94 | 2.33 | 2.06 | 2.39 |
| Salt | short ton | ---- | 1.08 | 1.08 | 1.08 | 3.11 | 3.11 |
| Sand and gravel: | | | | | | | |
| Sand | do | .77 | .71 | .76 | .87 | .84 | .81 |
| Gravel | do | .72 | .86 | .84 | .87 | 1.05 | 1.04 |
| Stone: | | | | | | | |
| Limestone: | | | | | | | |
| Crushed | do | 1.47 | 1.57 | 1.51 | 1.28 | 1.12 | 1.07 |
| Dimension | do | 46.61 | 47.90 | 145.14 | 43.75 | 38.96 | 44.03 |
| Marble: | | | | | | | |
| Crushed | do | (2) | (2) | 9.02 | 4.83 | 6.34 | 5.72 |
| Dimension | do | 150.87 | 112.04 | 98.14 | 124.09 | 97.53 | 177.47 |
| Sandstone: | | | | | | | |
| Crushed | do | 5.96 | 8.90 | 9.09 | 5.64 | 1.90 | 1.46 |
| Dimension | do | ---- | 15.85 | 13.46 | 17.43 | 15.52 | 16.93 |
| Talc | do | ---- | ---- | ---- | ---- | 5.33 | 2.05 |

[1] For greater detail on prices by grades and markets, see volume 1, Minerals Yearbook, 1956.
[2] Data not available.
[3] Figure withheld to avoid disclosing individual company confidential data.

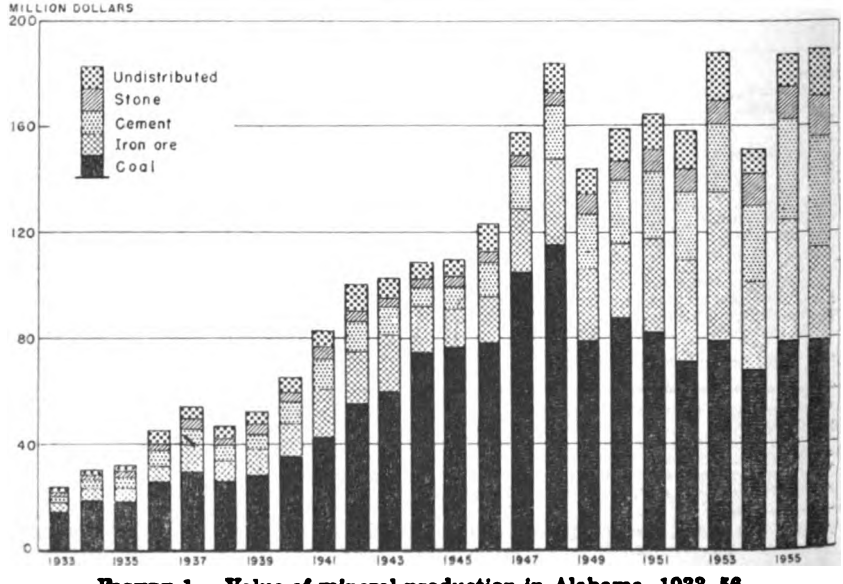



FIGURE 1.—Value of mineral production in Alabama, 1933–56.

Digitized by Google

The mineral industry was dominated by the mining and processing of coal and iron near Birmingham. Leading companies were Tennessee Coal & Iron Division of United States Steel Corp., Woodward Iron Co., Alabama Power Co., Southern Cement Division of American Marietta Co., and Ideal Cement Co.

Total value of production increased 1 percent above 1955 and was less than 1 percent below 1953, the record year.

## EMPLOYMENT AND INJURIES

Employment in the mineral industries increased 10 percent over 1955. Employment decreased 14 percent at coal mines, rose 95 percent at metal mines, expanded 74 percent at quarries and mills, declined 26 percent at coke ovens and smelters, increased 18 percent at sand and gravel mines, and was more than 3 times as high as in 1955 at nonmetal mines.

Injury experience was better than in 1955, as the frequency rate decreased 5 percent. The frequency rate declined 7 percent at coke ovens and smelters, decreased 44 percent at metal mines, increased 90 percent at nonmetal mines, decreased 2 percent at coal mines, and increased 27 percent at quarries and mills. Nineteen fatal injuries occurred, compared with 16 in 1955.

**TABLE 3.—Employment in the mineral industries, 1955–56 [1]**

| Industry | 1955 | | | 1956 [2] | | |
|---|---|---|---|---|---|---|
| | Men working daily | Average active days | Man-days worked | Men working daily | Average active days | Man-days worked |
| Coal mines | 9,074 | 211 | 1,915,180 | 7,978 | 208 | 1,655,974 |
| Metal mines | 1,872 | 242 | 452,286 | 3,836 | 230 | 883,231 |
| Quarries and mills | 1,607 | 283 | 454,054 | 2,835 | 279 | 792,119 |
| Coke ovens and smelters | 2,064 | 365 | 753,372 | 1,535 | 366 | 561,693 |
| Sand and gravel mines [3] | 349 | 263 | 91,852 | 419 | 259 | 108,502 |
| Nonmetal mines | 78 | 212 | 16,564 | 304 | 175 | 52,830 |
| Total | 15,044 | 245 | 3,683,308 | 16,907 | 240 | 4,054,349 |

[1] Excluding oil and gas.
[2] Preliminary figures.
[3] Excluding Government-and-contractor operations.

**TABLE 4.—Injuries in the mineral industries, 1955–56 [1]**

| Industry [2] | 1955 | | | | 1956 [3] | | | |
|---|---|---|---|---|---|---|---|---|
| | Fatal | Nonfatal | Total | Injuries per million man-days | Fatal | Nonfatal | Total | Injuries per million man-days |
| Coke ovens and smelters | | 35 | 35 | 46 | 2 | 22 | 24 | 43 |
| Metal mines | 4 | 37 | 41 | 91 | 2 | 43 | 45 | 51 |
| Nonmetal mines | | 1 | 1 | 60 | | 6 | 6 | 114 |
| Coal mines | 11 | 207 | 218 | 116 | 15 | 173 | 188 | 114 |
| Quarries and mills | 1 | 51 | 52 | 114 | | 115 | 115 | 145 |
| Total | 16 | 331 | 347 | 98 | 19 | 359 | 378 | 93 |

[1] Excluding oil and gas.
[2] Sand and gravel mines not canvassed.
[3] Preliminary figures.

Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## METALS

**Bauxite.**—Two companies mined crude bauxite in Barbour and Henry Counties for chemicals and refractories; the leading producer was R. E. Wilson. Production increased 6 percent over 1955 and was 67 percent above 1954.

**Iron Ore.**—Shipments of iron ore decreased 17 percent below 1955 and 5 percent below 1954 to the lowest quantity since 1938. This decrease was mainly due to replacing domestic ore with foreign imports rather than a declining iron and steel industry. Of the total shipments, 50 percent was direct shipping ore, 40 percent was concentrates, and 10 percent was sinter, compared with 55, 32, and 13 percent in 1955. The number of active mines increased from 32 to 46; average usable production per mine decreased from 212,000 tons to 122,000 tons.

Seven companies mined red iron ore at 8 mines near Birmingham, and 1 company mined red iron ore near Gadsden. The leading producer was Tennessee Coal & Iron Division of United States Steel Corp., at the Wenonah mines. Shipments declined 26 percent below 1955 and 13 percent below 1954 to the lowest quantity since 1938.

Twenty-six producers mined brown iron ore at 37 mines in 12 counties; the leading company was Shook & Fletcher Supply Co. at mines

**TABLE 5.—Mine production and shipments of crude iron ore, 1955–56**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Number of mines | Long tons | Number of mines | Long tons |
| Mine production— | | | | |
| By varieties: | | | | |
| Hematite | 7 | 6,165,458 | 9 | 4,506,076 |
| Brown ore | 25 | 3,802,275 | 37 | 5,164,863 |
| By mining methods: | | | | |
| Open-pit | 27 | 3,892,766 | 41 | 5,274,327 |
| Underground | 5 | 6,074,967 | 5 | 4,396,612 |
| Shipments from mines: | | | | |
| Direct to consumers | 8 | 3,773,781 | 11 | 2,825,867 |
| To beneficiation plants | 24 | 6,184,108 | 35 | 6,817,750 |

**TABLE 6.—Production and shipments of usable iron ore, 1955–56**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Long tons | Iron content, natural (percent) | Long tons | Iron content, natural (percent) |
| Production: | | | | |
| Hematite | 5,819,568 | 36 | 4,279,157 | 38 |
| Brown ore | 970,699 | 47 | 1,347,435 | 46 |
| Shipments: | | | | |
| Direct shipping ore | 3,773,781 | 36 | 2,825,867 | 38 |
| Concentrate | 2,157,889 | 39 | 2,255,841 | 39 |
| Sinter | 882,000 | 42 | 551,000 | 43 |

Digitized by Google

in Bibb, Blount, and Franklin Counties. Shipments (the greatest since 1942) expanded 43 percent over 1955 and 41 percent over 1954, owing to increased demand from iron and steel plants.

**TABLE 7.—Shipments of usable iron ore, 1947–51 (average) and 1952–56**

| Year | Long tons | Value | Year | Long tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 7,625,951 | $29,453,252 | 1954 | 5,913,462 | $33,327,083 |
| 1952 | 7,243,214 | 37,940,412 | 1955 | 6,813,670 | 44,657,215 |
| 1953 | 7,446,130 | 55,640,338 | 1956 | 5,632,708 | 34,824,465 |

**Pig Iron and Steel.**—Republic Steel Corp. (Thomas and Gulfsteel plants), U. S. Pipe & Foundry Co. (Birmingham and North Birmingham plants), Woodward Iron Co. (Woodward plant) and Tennessee Coal & Iron Division of United States Steel Corp. (Fairfield & Ensley plants) produced 4,167,000 tons of foundry, basic, and direct casting pig iron. Value of shipments was $217,315,000. Steel was produced by Tennessee Coal & Iron Division of United States Steel Corp. at the Ensley & Fairfield plants. Iron ore consumed was 72 percent domestic, and 28 percent was imported, mainly from Venezuela, Labrador, and Peru. Imports of iron ore exceeded those of any previous year.

**Ferroalloys.**—Shipments of ferromanganese, ferrophosphorus, ferrosilicon, silicomanganese, and spiegeleisen totaled 145,900 tons valued at $29,978,000.

## NONMETALS

**Cement.**—Masonry cement was produced by 7 companies at 7 plants in Blount, Jefferson, and St. Clair Counties. The leading producer was Southern Cement Division, American Marietta Co., in Jefferson County. Shipments decreased 10 percent below 1955.

Portland cement was produced by 7 companies at 9 plants in Jefferson, Marengo, Mobile, St. Clair, and Shelby Counties. The leading producer was Ideal Cement Co. in Mobile County, Shipments increased 4 percent above 1955 and 11 percent above 1954—a new record for the State.

Pozzolan cement was produced by Southern Cement Division, American Marietta Co., in Jefferson County and by Cheney Lime & Cement Co. in Blount County. Shipments decreased 21 percent below 1955.

**TABLE 8.—Shipments of portland cement, 1947–51 (average) and 1952–56**

| Year | 376-pound barrels | Value | Year | 376-pound barrels | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 10,002,885 | $20,964,645 | 1954 | 11,121,599 | $28,582,683 |
| 1952 | 10,642,409 | 25,084,379 | 1955 | 11,782,095 | 31,517,373 |
| 1953 | 10,427,542 | 25,701,421 | 1956 | 12,311,520 | 35,255,585 |

**Clays.**—Thirteen companies mined fire clay at 15 mines in 8 counties. The leading producer was Natco Corp. in Walker County. Production expanded 40 percent over 1955 and 29 percent over 1954—a record for the State.

Digitized by Google

Thomas Alabama Kaolin Co. mined kaolin in Marion County for floor and wall tile, fire brick and block, high-alumina brick, fertilizer filler, and insecticide filler.

Nineteen companies mined miscellaneous clay at 20 mines in 12 counties. The leading producer was Ideal Cement Co. in Mobile County. The clay was used to manufacture cement and heavy clay products. Production increased 3 percent above 1955 and 19 percent above 1954 and established a new record for the State. Production was 1,291,000 tons valued at $1,156,000.

**TABLE 9.—Fire clay sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 161,661 | $374,194 | 1954 | 235,731 | $985,960 |
| 1952 | 220,009 | 757,451 | 1955 | 216,289 | 1,102,776 |
| 1953 | 252,926 | 727,439 | 1956 | 303,329 | 990,240 |

**TABLE 10.—Fire clay sold or used by producers, 1955–56, by uses**

| Use | 1955 | 1956 | Use | 1955 | 1956 |
|---|---|---|---|---|---|
| | Short tons | Short tons | | Short tons | Short tons |
| Firebrick and block | (1) | 149,890 | Stoneware | | 20 |
| Heavy clay products | 95,864 | 92,387 | Other | 70,096 | |
| Foundries and steelworks | 50,329 | 55,405 | | | |
| Fire-clay mortar | (1) | 5,627 | Total | 216,289 | 303,329 |

[1] Figure withheld to avoid disclosing individual company confidential data. Included with "Other."

**Lime.**—Eight companies produced lime at 9 plants in Jefferson, Mobile, and Shelby Counties. The leading producer was Southern Cement Division, American Marietta Co., in Shelby County. During the year American Marietta purchased Keystone Lime Works. United Cement Co. constructed a new limekiln in Shelby County and began operating. Production increased 1 percent over 1955 and 11 percent over 1954 and was only 1 percent below 1953, the record year.

**TABLE 11.—Lime sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 387,565 | $3,346,040 | 1954 | 421,807 | $4,488,167 |
| 1952 | 424,028 | 4,458,604 | 1955 | 462,194 | 5,185,706 |
| 1953 | 470,541 | 5,018,156 | 1956 | 466,399 | 5,088,695 |

**TABLE 12.—Lime sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Chemical and industrial | 374,369 | $4,014,365 | 372,738 | $4,094,340 |
| Other | 87,825 | 1,171,341 | 93,661 | 994,355 |
| Total | 462,194 | 5,185,706 | 466,399 | 5,088,695 |

Digitized by Google

**Mica.**—Crude mica was mined by five companies or individuals in Clay, Cleburne, Coosa, and Randolph Counties. The leading producer was Dixie Mines, Inc., in Randolph County, which opened the Micaville mine during the year; it produced considerable scrap mica and shipped it to Texas for grinding. Sheet-mica production was shipped to the Spruce Pine (N. C.) Government Purchasing Depot—1,100 pounds valued at $6,800.

**Salt.**—Mathieson Chemical Corp. increased production of salt from brine at its plant in Washington County 3 percent over 1955 and 5 percent over 1954, a new record for the State.

**Sand and Gravel.**—Twenty-eight companies mined sand and gravel at 40 mines in 26 counties. The leading producer was Montgomery-Roquemore Gravel Co. in Elmore and Montgomery Counties. Production expanded 36 percent over 1955 and 26 percent over 1954 and established a new record for the State. This expansion was due to increased building construction and highway work throughout the State.

**TABLE 13.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Sand | | Gravel | | Total | |
|---|---|---|---|---|---|---|
| | Thousand short tons | Value | Thousand short tons | Value | Thousand short tons | Value |
| 1947–51 (average) | (1) | (1) | (1) | (1) | 3,514 | $2,443,142 |
| 1952 | (1) | (1) | (1) | (1) | 3,723 | 2,955,630 |
| 1953 | 1,571 | $1,196,831 | 2,140 | $1,805,852 | 3,711 | 3,002,683 |
| 1954 | 1,517 | 1,316,769 | 2,449 | 2,134,089 | 3,966 | 3,450,858 |
| 1955 | 1,652 | 1,384,113 | 2,028 | 2,139,411 | 3,680 | 3,523,524 |
| 1956 | 2,436 | 1,964,458 | 2,563 | 2,657,011 | 4,999 | 4,621,469 |

[1] Figure withheld to avoid disclosing individual company confidential data.

**TABLE 14.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Structural sand and gravel | 1,843,913 | $1,747,724 | 2,184,541 | $2,176,906 |
| Paving sand and gravel | 1,314,203 | 1,314,651 | 2,054,780 | 1,761,478 |
| Railroad ballast sand and gravel | (1) | (1) | 249,071 | 168,020 |
| Molding sand | 41,958 | 74,616 | (1) | (1) |
| Other | 480,099 | 386,533 | 510,496 | 515,065 |
| Total | 3,680,173 | 3,523,524 | 4,998,888 | 4,621,469 |

[1] Figure withheld to avoid disclosing individual company confidential data. Included with "Other."

**Stone.**—Alabama Asphaltic Limestone Co. mined native asphalt in Colbert County for roads.

Crushed limestone was produced by 28 companies at 36 quarries in 15 counties. The leading producer was Lone Star Cement Corp. in Jefferson, Marengo, and Washington Counties. Production increased 20 percent over 1955 and 32 percent over 1954 and established a new record for the State. This increase was due mainly to expanded highway construction throughout the State.

Digitized by Google

**TABLE 15.—Crushed limestone sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 2,517,131 | $3,717,654 | 1954 | 7,195,748 | $9,237,726 |
| 1952 [1] | 2,936,029 | 6,051,287 | 1955 | 7,943,152 | 8,888,665 |
| 1953 [1] | 3,815,076 | 5,779,804 | 1956 | 9,516,938 | 10,213,821 |

[1] Except for cement and lime.

**TABLE 16.—Crushed limestone sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Cement manufacture | 3,676,392 | $2,485,459 | 3,784,284 | $2,610,098 |
| Concrete and roads | 1,145,037 | 1,316,905 | 2,818,013 | 3,441,290 |
| Fluxing stone | 1,859,090 | 2,926,606 | 1,661,590 | 2,228,118 |
| Lime manufacture | 511,059 | 809,124 | 521,356 | 619,744 |
| Agstone | 329,389 | 473,425 | 409,255 | 531,587 |
| Rock dusting (coal mines) | 63,492 | 265,414 | (1) | (1) |
| Riprap | (1) | (1) | 90,138 | 130,088 |
| Other | 358,693 | 611,732 | 232,302 | 652,896 |
| Total | 7,943,152 | 8,888,665 | 9,516,938 | 10,213,821 |

[1] Figure withheld to avoid disclosing individual company confidential data. Included with "Other."

Alabama Limestone Co. quarried dimension limestone in Franklin County. Production increased 15 percent over 1955 and 61 percent over 1954.

Three companies crushed marble at 3 quarries in Talladega County. The leading producer was Moretti-Harrah Marble Co.

Two companies quarried dimension marble at 2 quarries in Talladega County. The leading producer was Moretti-Harrah Marble Co. Production declined 39 percent below 1955 and 15 percent below 1954.

Radcliff Gravel Co. produced oystershell by dredging from Mobile Bay.

Four companies crushed sandstone at 4 quarries in Jackson and Jefferson Counties. The leading producer was Jackson County Highway Department. Production was 188,000 tons valued at $275,000—an expansion of 38 percent over 1955 and considerably more than was produced in 1954. The crushed stone was employed for refractory purposes, concrete and roads, foundry use, and cement manufacture.

Two companies quarried dimension sandstone at 3 quarries in Blount and De Kalb Counties. The leading producer was De Kalb Stone Co., in De Kalb County. Production decreased 19 percent below 1955 and 41 percent below 1954 and amounted to 3,200 tons valued at $53,000. The stone was used for rough construction, rough architectural building stone, and flagging.

**Talc.**—American Talc Co. mined crude talc in Talladega County. Production expanded 47 percent over 1955. The crude talc was ground for filler in insecticides.

Digitized by Google

## MINERAL FUELS

**Coal.**—Coal was mined at 225 mines in 12 counties. Leading counties were Jefferson, Walker, and Tuscaloosa. The leading producer was Tennessee Coal. & Iron Division, United States Steel Corp., in Jefferson County. Production decreased 3 percent below 1955 but was 23 percent above 1954. This decrease was due mainly to lowered demand for coke for iron and steel plants.

**TABLE 17.—Coal production, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 15, 760, 360 | $93, 967, 017 | 1955 | 13, 088, 477 | $79, 337, 006 |
| 1952 | 11, 383, 427 | 70, 759, 815 | 1956 | 12, 663, 344 | 79, 322, 439 |
| 1953 | 12, 532, 061 | 79, 370, 036 | | | |
| 1954 | 10, 282, 506 | 64, 029, 502 | Earliest record to date | 910, 246, 000 | (1) |

[1] Data not available.

**Natural Gas.**—The State's only producing gasfield was near Hamilton in Marion County. Three wells have been completed, but only 2 have been on production. Allowable production was 1 million cubic feet per day.

In addition to the above, there were shut-in discoveries at East Bankston, Fayette County, and near Poplar Springs, Winston County. Further development was taking place in both areas, and there was exploration activity in other parts of the Warrior Coal Basin. The shut-ins, like the Hamilton wells, are minimum wells.

Production in all gas wells came from beds of Mississippian age at comparatively shallow depths.

**TABLE 18.—Marketed production of natural gas, 1950–51 (average) and 1952–56**

| Year | Thousand cubic feet | Value | Year | Thousand cubic feet | Value |
|---|---|---|---|---|---|
| 1950–51 (average) | 1, 500 | $75 | 1954 | 87, 000 | $5, 000 |
| 1952 | 4, 000 | 160 | 1955 | 282, 000 | 20, 000 |
| 1953 | 41, 000 | 2, 000 | 1956 | 42, 000 | 3, 000 |

**Petroleum.**—Oil production increased, owing entirely to the increased yield from the Citronelle field in northern Mobile County. Producing horizons were the Rodessa and Bailey sands of Lower Cretaceous age at depths ranging from 10,850 to 11,500 feet. The oil was 42 to 45 gravity. Allowable production was 200 barrels per day from the Rodessa and 150 barrels per day from the Bailey, or 350 barrels per day from dually completed wells. Most wells were on pump, because the gas-oil ratio was too low (about 150 : 1) to force the oil into surface tanks. The field was about two-thirds developed at the year end. The discovery well was brought in August 16, 1955.

Alabama's first commercial field, Gilbertown (discovery well February 17, 1944), was declining as expected. Many of the producing wells were "strippers." Production came from Upper Cretaceous beds at 2,800 to 3,500 feet. The oil was heavy (18°) and

Digitized by Google

asphalt base. The wells are strung out along a fault plane reaching from the Mississippi line almost to the Tombigbee River. It seemed unlikely that secondary recovery could be successfully applied to this field.

The South Carlton field, in adjacent parts of Clarke and Baldwin Counties, was only partly developed. The oil is heavy (14°). Production was from the Lower Tuscaloosa formation of Upper Cretaceous age at about 6,200 feet.

The State's second largest producing field, Pollard, in Escambia County was holding up well. Discovery was January 19, 1952, in Lower Tuscaloosa sands at about 6,100 feet. There were three different producing sands in the field, all fairly close together. Gravity of the oil ranges from 25° to 30°. Many of the wells flowed for a few months even though the gas-oil ratio was only 50 : 1. All were on pump in 1956. The number of producing wells in 1956, by counties, was as follows:

| County: | *Number of wells* |
|---|---|
| Baldwin | 3 |
| Clarke | 8 |
| Choctaw | 61 |
| Escambia | 36 |
| Mobile | 97 |
| Total for State | 205 |

At the end of the year 166 wells were producing.

**TABLE 19.—Production of crude petroleum, 1947–51 (average) and 1952–56**

| Year | Thousand 42-gallon barrels | Year | Thousand 42-gallon barrels |
|---|---|---|---|
| 1947–51 (average) | 616 | 1955 | 1,411 |
| 1952 | 1,279 | 1956 | 3,069 |
| 1953 | 1,694 | | |
| 1954 | 1,584 | 1944–56 (total to date) | 9,653 |

## REVIEW BY COUNTIES

Jefferson County again dominated the mineral industry of the State and supplied 59 percent of the total value of production.

In addition to the listing for each county, production of natural gas and petroleum and of a small quantity of engine sand produced by the Atlanta & West Point Railroad Co. is of undetermined county origin.

**Baldwin.**—Fairhope Clay Products Co. mined 5,200 tons of miscellaneous clay for heavy clay products. Hinote Sand Supply Co. mined 9,700 tons of structural sand.

**Barbour.**—D. M. Wilson Bauxite Co. and R. E. Wilson mined bauxite for chemicals and refractories. Glenwood Mining Co., Inc., opened a new mine and shipped 57,000 tons of brown iron ore to iron and steel plants. Alabama State Highway Department mined 54,000 tons of paving sand.

**Bibb.**—Shook & Fletcher Supply Co. (Adkins mine) mined brown iron ore for sale to iron and steel plants. Coal production from 8

Digitized by Google

active mines was 88,000 tons; H. E. Hicks Coal Co. (Belle Ellen No. 9 mine) and Black Diamond Coal Co. (Blocton No. 9 mine) were the leading producers.

**TABLE 20.—Value of mineral production in Alabama, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Baldwin | $12,232 | $11,920 | Sand and gravel, miscellaneous clay. |
| Barbour | (2) | (2) | Bauxite, iron ore, sand and gravel. |
| Bibb | (2) | (2) | Iron ore, coal. |
| Blount | (2) | 2,430,768 | Coal, limestone, iron ore, cement, fire clay, sandstone. |
| Butler | (2) | 253,677 | Iron ore. |
| Calhoun | 282,198 | 320,720 | Sand and gravel, fire clay, miscellaneous clay, iron ore. |
| Cherokee | (2) | (2) | Iron ore. |
| Chilton | (2) | 100 | Fire clay. |
| Clarke | | 16,982 | Sand and gravel. |
| Clay | (2) | 2,065 | Mica. |
| Cleburne | (2) | (2) | Do. |
| Colbert | (2) | (2) | Asphalt (native), limestone, sand and gravel. |
| Coosa | 1,933 | (2) | Mica. |
| Covington | | 67,500 | Sand and gravel. |
| Crenshaw | (2) | (2) | Iron ore. |
| Cullman | 257,731 | 564,870 | Limestone, coal. |
| Dallas | 408,816 | 607,124 | Sand and gravel. |
| De Kalb | 488,425 | 405,138 | Coal, limestone, sandstone. |
| Elmore | (2) | (2) | Sand and gravel. |
| Escambia | (2) | (2) | Sand and gravel, miscellaneous clay. |
| Etowah | (2) | 566,971 | Limestone, sand and gravel, iron ore. |
| Fayette | 1,616 | 30,930 | Sand and gravel, miscellaneous clay. |
| Franklin | (2) | 4,777,804 | Iron ore, limestone, sand and gravel, fire clay. |
| Greene | (2) | (2) | Sand and gravel. |
| Henry | | 63,024 | Bauxite, sand and gravel. |
| Houston | | 52,891 | Sand and gravel, iron ore. |
| Jackson | 197,976 | 580,257 | Limestone, sandstone, coal. |
| Jefferson | 120,034,968 | 111,865,272 | Coal, iron ore, cement, limestone, lime, miscellaneous clay, fire clay, sandstone. |
| Limestone | 56,000 | 44,800 | Limestone. |
| Macon | 104,718 | 56,348 | Sand and gravel. |
| Madison | (2) | (2) | Limestone, miscellaneous clay. |
| Marengo | (2) | (2) | Cement, limestone. |
| Marion | (2) | (2) | Coal, kaolin, sand and gravel. |
| Mobile | (2) | (2) | Cement, oystershell, lime, miscellaneous clay, sand and gravel. |
| Monroe | 5,450 | 4,930 | Sand and gravel. |
| Montgomery | (2) | (2) | Sand and gravel, miscellaneous clay. |
| Morgan | (2) | 985,840 | Limestone, sand and gravel. |
| Pike | 402,725 | 552,041 | Iron ore, sand and gravel. |
| Randolph | (2) | (2) | Mica. |
| Russell | (2) | 581,460 | Miscellaneous clay, sand and gravel. |
| St. Clair | (2) | (2) | Cement, limestone, miscellaneous clay, fire clay, sand and gravel, coal. |
| Shelby | (2) | 8,731,359 | Lime, limestone, cement, coal, iron ore, miscellaneous clay, fire clay. |
| Sumter | 801 | 75,000 | Sand and gravel. |
| Talladega | (2) | 1,924,731 | Marble, iron ore, talc. |
| Tuscaloosa | 3,110,000 | 3,203,744 | Coal, sand and gravel. |
| Walker | 17,923,175 | 18,014,235 | Coal, fire clay. |
| Washington | (2) | (2) | Limestone, salt, miscellaneous clay. |
| Wilcox | 312 | | |
| Winston | 6,000 | 92,618 | Coal. |
| Undistributed [3] | 43,157,924 | 32,300,881 | |
| Total Alabama | 186,453,000 | 189,186,000 | |

[1] Individual county figures exclude petroleum and natural gas. The following counties are not listed because no production was reported: Autauga, Bullock, Chambers, Choctaw, Coffee, Conecuh, Dale, Geneva, Hale, Lamar, Lauderdale, Lawrence, Lee, Lowndes, Marshall, Perry, Pickens, and Tallapoosa.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes natural gas, petroleum, and values indicated by footnote 2.

**Blount.**—Coal produced from 7 active mines totaled 224,000 tons. Robbins Coal Co., Inc. (Southview Strip mine), and Alabama Coal & Ore Co., Inc. (Hopewell Strip mine), were the leading producers. Stockbridge Stone Co. (No. 609 quarry) opened a new quarry and

Digitized by Google

crushed 260,000 tons of limestone for concrete and roads. Shook & Fletcher Supply Co. (Taits Gap mine) mined brown iron ore for sale to iron and steel plants. Cheney Lime & Cement Co. produced masonry and pozzolan cement at the Graystone mill. Harbison-Walker Refractories Co. (Nyota and Thermal mines) and Lehigh Coal Co. (Trafford mine) mined fire clay for firebrick and block and for heavy clay products. A. O. Brown quarried 500 tons of dimension sandstone for rough construction building stone.

**Butler.**—Carroll Mining Co., Conners & Archer Mining Co., Southern Iron Corp., and E. L. Speed mined brown iron ore for sale to iron and steel plants.

**TABLE 21.—Shipments of brown iron ore in Butler County, 1952–56**

| Year | Long tons | Value | Year | Long tons | Value |
|---|---|---|---|---|---|
| 1952 | 2,749 | $15,065 | 1955 | (1) | (1) |
| 1953 | 71,732 | 404,011 | 1956 | 41,861 | $253,677 |
| 1954 | 66,530 | 409,006 | | | |

[1] Figure withheld to avoid disclosing individual company confidential data.

**Calhoun.**—John B. Lagarde mined 116,000 tons of paving sand and gravel. Donoho Foundry Co. mined 35,000 tons of fire clay for foundries and steelworks. Agricola Brick Co. mined miscellaneous clay for use in making brick. Price & Jackson and B. F. Sweet mined brown iron ore for the iron and steel industry.

**Cherokee.**—Baker & Howell (Baker-Howell mine), Erwin & Mashburn (Spring Garden mine), and Margemma Mining Co. (Laney Hollow mine) mined brown iron ore for iron and steel.

**Chilton.**—Norman E. Smith mined 20 tons of fire clay for stoneware.

**Clarke.**—Alabama State Highway Department and Jackson Sand & Gravel Co. mined 15,000 tons of structural and paving sand and structural, paving, and other gravel.

**Clay.**—S. P. Lett (Bob Lee mine) mined 103 pounds of sheet mica.

**Cleburne.**—McDowell Mining Co. (Cavers mine) mined sheet mica.

**Colbert.**—Alabama Asphaltic Limestone Co. (Margerum quarry) mined native asphalt for roadstone. Alabama Asphaltic Limestone Co. and Tri-State Limestone Co. crushed limestone for concrete and roads and for agstone. Tennessee Valley Sand & Gravel Co. (Sheffield mine) mined structural and paving sand and gravel.

The capacity of the Reynolds Listerhill plant was increased in 1956 by 27,500 tons a year to bring the total plant capacity to 77,500 short tons of aluminum a year.

In January, Reynolds announced that work was to begin on constructing a new primary aluminum plant near its present plant at Listerhill, Ala. The new facility, costing between $75 and $80 million and having an annual capacity of 100,000 tons, was to use power supplied by the Tennessee Valley Authority. Initial production was scheduled for the end of 1957. Reynolds also had a contract providing for shipment of an average of 32,000 tons of metal a year, over a 10-year period, to a new foundry of the Ford Motor Co., which was to

Digitized by Google

be constructed adjacent to the Reynolds' plant. Most of the metal was to be shipped in the molten state. Later in the year the capacity of the new plant was revised to 112,500 tons.

**Coosa.**—Norris Mica Co. (Smith mine) mined sheet mica.

**Covington.**—Alabama State Highway Department mined 121,000 tons of paving sand.

**Crenshaw.**—Arrington Mining Co., Carroll Mining Co., and Glenwood Mining Co., Inc., mined brown iron ore for iron and steel.

**Cullman.**—Alabama State Highway Department, and Stockbridge Stone Co. (No. 610 quarry) crushed 220,000 tons of limestone for concrete and roads. Coal produced from 4 active mines totaled 41,000 tons. H. E. Drummond Coal Co. (Arkadelphia No. 2 strip mine) was the leading producer.

**Dallas.**—C. Pierson Cosby, Dallas Sand & Gravel Co., Inc., and Southeastern Sand & Gravel Co. mined molding, structural, paving, engine, and railroad ballast sand, and structural, paving, railroad ballast and other gravel.

**TABLE 22.—Sand and gravel production in Dallas County, 1953–56**

| Year | Sand | | Gravel | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1953 | 326,971 | $164,629 | 243,938 | $225,002 | 570,909 | $389,631 |
| 1954 | 364,432 | 201,076 | 329,774 | 343,518 | 694,206 | 544,594 |
| 1955 | 194,671 | 113,336 | 265,891 | 275,480 | 460,562 | 408,816 |
| 1956 | 394,193 | 259,638 | 339,551 | 347,486 | 733,744 | 607,124 |

**De Kalb.**—Georgia-Alabama Ore Co. (Gibson's Gap strip mine) mined 55,000 tons of coal. Miller Limestone Co. crushed 46,000 tons of limestone for concrete and roads. De Kalb Stone Co. (Gorham and Skirum quarries) quarried 2,600 tons of dimension sandstone for rough architectural building stone and for flagging.

**Elmore.**—Alabama Gravel Co., Alabama State Highway Department, and Montgomery-Roquemore Gravel Co. (No. 3 mine) mined molding, structural, paving, blast, and engine sand and structural, paving, railroad ballast, and other gravel.

**Escambia.**—Dixie Sand & Gravel Co. and Flomaton Gravel Co. mined structural and paving sand and gravel. Keego Clay Products Co. mined 800 tons of miscellaneous clay for heavy clay products.

**Etowah.**—Alabama Aggregate Co. (Cobb City quarry) and Gadsden Stone Co. crushed 248,000 tons of limestone for riprap, fluxing stone, concrete and roads, agstone, and asphalt filler. Milner Sand Co. mined molding, structural, and paving sand and structural and paving gravel. Bowen Construction Co. mined red iron ore for sale to iron and steel plants.

**Fayette.**—Fayette Concrete Pipe Co. mined 30,000 tons of structural sand and structural and paving gravel. Columbus Brick Co. mined 4,700 tons of miscellaneous clay for use in making brick.

**Franklin.**—A. G. Britton (Britton mine), Robert Fuller (Fuller mine), Hester & Farned, Shook & Fletcher Supply Co. (Blackburn and Warner mines), U. S. Pipe & Foundry Co. (Russellville No. 15, No. 16 and No. 17 mines), and F. F. Wilson & Sons mined brown

Digitized by Google

iron ore for iron and steel. Alabama Limestone Co. (Rockwood quarry) quarried dimension limestone for rubble, rough architectural, and dressed building stone, and crushed limestone for concrete and roads, agstone, rock dust for coal mines, filter beds, mineral food, and other uses. Alabama State Highway Department and Tennessee Valley Sand & Gravel Co. (Spruce Pine mine) mined structural and paving sand and gravel. Tennessee Valley Sand & Gravel Co. mined fire clay for fire-clay mortar.

**Greene.**—Akron Sand Co. mined structural and paving sand and gravel.

**Henry.**—D. M. Wilson Bauxite Co. (Cleveland Stanley mine) mined bauxite for refractories. Alabama State Highway Department mined 54,000 tons of paving sand.

**Houston.**—L. C. Smith Sand & Gravel Co. and Speigner Concrete Block Co. mined 34,000 tons of structural sand. L. V. Chandler mined brown iron ore for iron and steel.

**Jackson.**—Alabama State Highway Department (Paint Rock Creek quarry) and Jackson County Highway Department crushed 237,000 tons of limestone for concrete and roads. Jackson County Highway Department crushed 162,000 tons of sandstone for concrete and roads. Coal production of 19,000 tons came from 3 active mines; Widows Creek Coal Co. (Armstrong mine) was the leading producer.

**Jefferson.**—Coal production of 8,532,000 tons came from 69 active mines; United States Steel Corp. (Concord No. 1 mine), Alabama By-Product Corp. (Maxine mine), United States Steel Corp. (Edgewater mine), Woodward Iron Co. (Mulga mine), and U. S. Pipe & Foundry Co. (Flat Top mine) were the chief producers.

E. C. Bookout, Republic Steel Corp. (Edwards mine), Shelby Coal Co., Southeastern Coal & Iron Co. (Trussville mine), Tennessee Coal & Iron Division, United States Steel Corp. (Wenonah mines), U. S. Pipe & Foundry Co. (Sloss Red Ore mine), and Woodward Iron Co. (Songo and Pyne mines) mined red iron ore for use in iron and steel plants.

Masonry cement was produced by Alpha Portland Cement Co. (Phoenixville mill), American Marietta Co. (North Birmingham mill), Lehigh Portland Cement Co. (Birmingham mill), Lone Star Cement Corp. (Birmingham mill), and Univeral Atlas Cement Co. (Leeds mill). Portland cement was produced by Alpha Portland Cement Co., American Marietta Co., Lehigh Portland Cement Co., Lone Star Cement Corp., and Universal Atlas Cement Co. Pozzolan cement was produced by American Marietta Co. Alpha Portland Cement Corp., Dolcito Quarry Co., Lehigh Portland Cement Co., Lone Star Cement Corp., Tennessee Coal & Iron Division, United States Steel Corp. (Dolonah quarry and No. 5 Limestone mine), Universal Atlas Cement Co. and U. S. Pipe & Foundry Co. (Sloss North Birmingham quarry) crushed limestone for fluxing stone, refractory purposes, concrete and roads, railroad ballast, agstone, rock dust for coal mines, cement, and lime. Tennessee Coal & Iron Division of United States Steel Corp. (Ensley Works) produced lime for refractory, chemical, and industrial use. Lehigh Portland Cement Co., Lone Star Cement Corp., Stephenson Brick Co., Universal Atlas Cement Co., and Watkins Brick Co. mined miscellaneous clay for cement and for heavy clay products. Bibby Coal, Shale & Clay Co.,

Digitized by Google

Dixie Fire Brick Co., Inc., and J. E. Moore mined fire clay for fireclay mortar and for foundries and steelworks. Sam P. Acton, Universal Atlas Cement Co., and Enos E. Vann crushed sandstone for refractory purposes, concrete and roads, foundry uses, and cement.

**TABLE 23.—Portland-cement shipments in Jefferson County, 1948–51 (average) and 1952–56**

| Year | 376-pound barrels | Value | Year | 376-pound barrels | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 6,068,224 | $13,269,889 | 1954 | 6,577,320 | $16,865,621 |
| 1952 | 6,289,918 | 15,007,623 | 1955 | 6,784,814 | 18,155,302 |
| 1953 | 6,090,801 | 15,255,438 | 1956 | 6,796,991 | 19,706,508 |

**TABLE 24.—Miscellaneous clay sold or used by producers in Jefferson County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) [1] | 152,425 | $131,548 | 1954 | 285,255 | (2) |
| 1952 [1] | 111,373 | 207,995 | 1955 | 299,004 | $259,685 |
| 1953 [1] | 87,508 | 87,508 | 1956 | 257,531 | 195,920 |

[1] Except clay for cement.
[2] Figure withheld to avoid disclosing individual company confidential data.

**Limestone.**—Limestone County Board of Revenue crushed 32,000 tons of limestone for concrete and roads.

**Macon.**—Sharpe Sand & Gravel Co. mined 50,000 tons of structural and paving sand and gravel.

**Madison.**—Madison Limestone Co. crushed limestone for concrete and roads, agstone, asphalt filler, and cement. Alabama Brick & Tile Co., and Huntsville Brick & Title Co., Inc., mined miscellaneous clay for heavy clay products.

**Marengo.**—Lone Star Cement Corp. produced portland cement at the Spocari mill throughout the year. The Lone Star Cement Corp. crushed limestone for use in making cement.

**Marion.**—Coal production was 379,000 tons at 47 active mines; Liberty Coal Co. (Liberty mine) was the leading producer. Thomas Alabama Kaolin Co., the State's only kaolin producer, mined kaolin for floor and wall tile, fire brick and block, high-alumina brick, fertilizers, and insecticides. Alabama State Highway Co. mined 32,000 tons of paving sand and gravel.

**Mobile.**—Aluminum Company of America operated the largest alumina plant in the United States at Mobile, using bauxite imported from Surinam. Throughout the year, Ideal Cement Co., the leading cement producer in the State, produced portland cement from oystershell at the Mobile mill, manufactured lime for chemical and industrial uses from oystershell, at the Mobile limekiln, and mined miscellaneous clay for use in making cement. Radcliff Gravel Co. dredged oystershell from Mobile Bay for sale to cement and lime plants, and for concrete, agriculture, and poultry grit.

**Monroe.**—Excel Sand & Gravel Co. and Mannings Sand & Gravel Co. mined 6,000 tons of structural sand and structural and paving gravel.

465877—58——6

Digitized by Google

**Montgomery.**—Alabama Gravel Co., Belser Brothers, City Sand & Gravel Co., Inc., Montgomery County Highway Department, and Montgomery-Roquemore Gravel Co. (No. 1 and No. 2 mines) mined molding, structural, paving, blast, and engine sand and structural, paving, railroad ballast, and other gravel. Excelsior Brick Co. and Jenkins Brick Co. mined miscellaneous clay for heavy clay products.

**Morgan.**—Alabama State Highway Department, Holland & Woodward Co., Trinity Stone Co., and Waters Construction Co. crushed 659,000 tons of limestone for riprap, concrete and roads, and agstone. Decatur Sand & Gravel Co. mined structural and paving sand and gravel.

**Pike.**—Arrington Mining Co., Big Creek Mining Co., Carroll Mining Co., Conners & Archer, Glenwood Mining Co., Inc., Luverne Mining Co., Pike County Mining Co., Pike County Mining Corp., and Smith Mining Co. mined brown iron ore for sale to iron and steel plants. Alabama State Highway Department mined 54,000 tons of paving sand.

**TABLE 25.—Shipments of brown iron ore in Pike County, 1953–56**

| Year | Long tons (gross weight) | Value | Year | Long tons (gross weight) | Value |
|---|---|---|---|---|---|
| 1953 | 10,652 | $51,969 | 1955 | 96,214 | $402,726 |
| 1954 | 117,836 | 574,826 | 1956 | 103,754 | 522,041 |

**Randolph.**—Dixie Mines, Inc. (Shefner, Silver Leaf, and Liberty mines), and J. J. New (Randolph mine) mined sheet mica for sale to the Government. Dixie Mines, Inc. (Micaville mine), mined scrap mica, which was shipped to Texas for grinding. J. J. New produced a small quantity of scrap mica.

**Russell.**—Bickerstaff Brick Co., Bickerstaff Co., Inc., and Dixie Brick Co. mined miscellaneous clay for use in making brick. Consolidated Gravel Co., Inc., and Jones Sand & Gravel Co. mined paving sand and structural and paving gravel.

**St. Clair.**—National Cement Co. produced masonry and portland cement at the Ragland Mill throughout the year. National Cement Co. crushed limestine for use in making cement and for asphalt filler and mined miscellaneous clay for use in cement. Riverside Clay Co. mined 10,000 tons of fire clay for foundries and steelworks. Wolf Creek Sand Co. mined 7,000 tons of molding sand. Armstrong & Armstrong (A & A Strip mine) mined 3,000 tons of coal.

**Shelby.**—Alabaster Lime Co. (Scotrock limekiln), Cheney Lime & Cement Co. (Landmark limekiln), Dixie Lime & Manufacturing Co., Inc. (Pelham limekiln), Longview Lime Corp. (Saginaw limekiln), Southern Cement Division, American Marietta Co. (Keystone and Roberta limekilns), and United Cement Co. produced lime for building, agricultural, and chemical and industrial uses. Alabama Aggregate Co. (Pelham quarry), Alabaster Lime Co. (Scotrock quarry),

Digitized by Google

Cheney Lime & Cement Co. (Landmark quarry), Dixie Lime & Manufacturing Co., Inc., Longview Lime Corp. (Saginaw A quarry), Montevallo Limestone Co., Southern Cement Division, American Marietta Co., and Stockbridge Stone Co. (Calera quarry), crushed 2,001,000 tons of limestone for riprap, fluxing stone, concrete and roads, railroad ballast, agstone, paper filler, rock dust for coal mines, cement, lime, and other uses. Southern Cement Division, American Marietta Co. produced portland cement at the Calera mill throughout the year. Coal production was 86,000 tons at 19 active mines; River Valley Coal Co. (No. 3 and No. 8 mines) was the leading producer. Shelby Sand & Ore Co. mined brown iron ore for iron and steel. Southern Cement Division, American Marietta Co. mined miscellaneous clay for cement. Montevallo Clay Co. mined fire clay for foundries and steelworks.

TABLE 26.—Lime sold or used by producers in Shelby County, 1948–51 (average) and 1952–56

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) [1] | 194,204 | $1,895,621 | 1954 | 287,912 | $3,125,013 |
| 1952 [1] | 274,842 | 2,914,493 | 1955 | 312,645 | 3,661,509 |
| 1953 | 303,303 | 3,281,875 | 1956 | 329,283 | 3,612,159 |

[1] Sales only.

**Sumter.**—Alabama State Highway Department mined 101,000 tons of paving sand.

**Talladega.**—Alabama Marble Co., Moretti-Harrah Marble Co., and Thompson-Weinman & Co. crushed 185,000 tons of marble for terrazzo, whiting, and other uses. Alabama Marble Co. and Moretti-Harrah Marble Co. quarried dimension marble for interior, cut, dressed building stone, rough monumental, and cut, dressed monumental stone. De Shor Mining Co. Inc. (Parker No. 1 mine) and Rucker Mining Co. (Munford mine) mined brown iron ore for iron and steel. American Talc Co. (Winterboro mine), Alabama's only talc producer, mined 2,200 tons of talc.

**Tuscaloosa.**—Coal production was 686,000 tons from 12 active mines; Twin Seam Mining Co. (Kellerman No. 4 Strip mine), Mitchell Brothers Construction Co. (Mitchell No. 2 and No. 3 Strip mines), and Center Coal Co. (Brookwood Strip mine) were the leading producers. Yazoo Gravel Co., Inc., mined 140,000 tons of structural sand and gravel.

**Walker.**—Coal production was 2,532,000 tons at 52 active mines; Alabama Power Co. (Gorgas mine), DeBardeleben Coal Corp. (Empire No. 3 mine), McCoy Coal Co. (Mary Lee No. 7 Strip mine), Bankhead Mining Co., Inc. (Aldridge Strip mine), and DeBardeleben Coal Corp. (Empire Strip mine) were the leading producers. Harbison-Walker Refractories Co., Harris Coal & Clay Co., Natco Corp., and Russell Coal & Clay Co. mined fire clay for firebrick and block and for heavy clay products.

Digitized by Google

TABLE 27.—Fire clay sold or used by producers in Walker County, 1948–51 (average) and 1952–56

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 81,974 | $237,846 | 1954 | 141,190 | $714,604 |
| 1952 | 105,407 | 500,194 | 1955 | 111,297 | 798,125 |
| 1953 | 126,492 | 330,779 | 1956 | 190,797 | 642,670 |

**Washington.**—Lone Star Cement Corp. crushed limestone and mined miscellaneous clay for use in making cement. Mathieson Chemical Corp., the only salt producer, recovered salt from brine at its plant near McIntosh.

**Winston.**—Charles Wheeler Coal Co. (No. 1 Strip mine) and Twin Arrows Coal Co. (No. 1 mine) mined 18,000 tons of coal.

Digitized by Google

# The Mineral Industry of Alaska

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Department of Mines, Territory of Alaska.**

By Alvin Kaufman,[1] Anthony Evans,[2] Phil R. Holdsworth,[3] and May G. Downey[4]

THE VALUE of Alaskan mineral production declined 8 percent in 1956 compared with 1955, primarily as a result of a decrease in sand and gravel output. Coal output increased in quantity and value; completion of military projects (such as construction of powerhouses), which resulted in a decline in sand and gravel production, was largely responsible for the increased demand for coal.

In value of output, gold mining remained first, despite a substantial decline in quantity produced; coal mining ranked second; and sand and gravel (second in 1955) was third. Output of these three commodities comprised 84 percent of the total value of minerals produced in 1956.

**TABLE 1.—Mineral production in Alaska, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Chromite.....gross weight | 7,082 | $625,340 | 7,193 | $711,481 |
| Clays | 1,112 | 3,836 | | |
| Coal, bituminous | 639,696 | 5,759,000 | 726,801 | 6,373,976 |
| Copper (recoverable content of ores, etc.) | 1 | 746 | (2) | (2) |
| Gold (recoverable content of ores, etc.)...troy ounces | 249,294 | 8,725,290 | 209,296 | 7,325,360 |
| Lead (recoverable content of ores, etc.) | 1 | 298 | 1 | 314 |
| Mercury.....76-pound flasks | (2) | (2) | 3,280 | 852,538 |
| Sand and gravel | 9,793,214 | 8,242,344 | 5,955,105 | 5,879,799 |
| Silver (recoverable content of ores, etc.)...troy ounces | 33,693 | 30,494 | 28,360 | 25,667 |
| Stone | 265,740 | 289,589 | 194,864 | 594,894 |
| Tin (content of concentrate).....long tons | 86 | 182,484 | | |
| Value of items that cannot be disclosed: Antimony (1956), gem stones, platinum-group metals, and values indicated by footnote [3] | | 1,552,428 | | 1,643,937 |
| Total Alaska | | 25,412,000 | | 23,408,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Less than 1 ton; value not included in total.
[3] Figure withheld to avoid disclosing individual company confidential data.

[1] Supervising commodity-industry analyst, Region I, Bureau of Mines, Juneau, Alaska.
[2] Commodity-industry analyst, Region I, Bureau of Mines, Juneau, Alaska.
[3] Commissioner of Mines, Department of Mines, Territory of Alaska, Juneau, Alaska.
[4] Statistical assistant, Region I, Bureau of Mines, Juneau, Alaska.



Digitized by Google

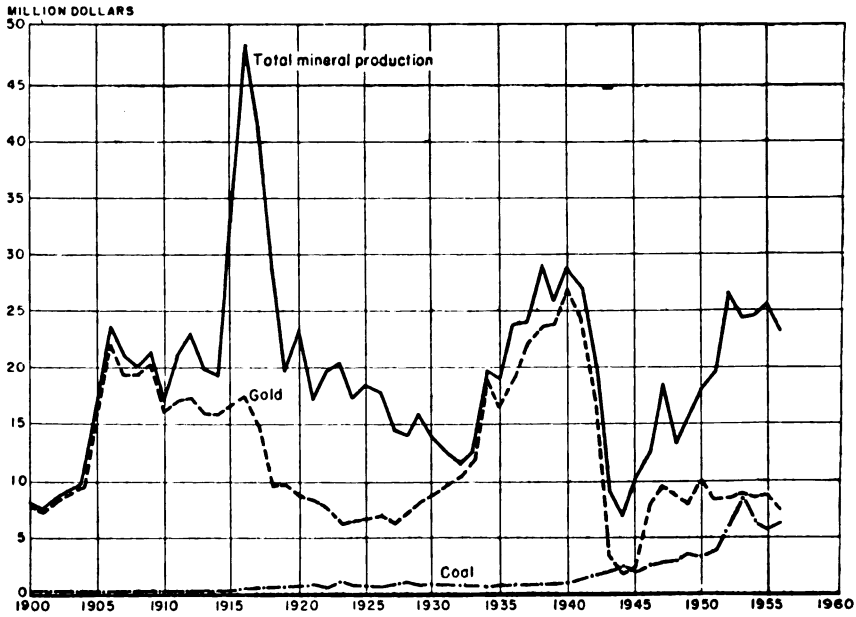



FIGURE 1.—Value of total mineral production, gold, and coal in Alaska, 1900–56. From 1911–31 copper production accounted for most of the value of minerals other than gold and coal.

Mercury production in 1956 more than doubled the cumulative output of the preceding 9 years, principally because the Red Devil mine resumed full operation after replacing its furnace, which was destroyed by fire in October 1954. Chromite output remained virtually stable. Platinum-group metals and small quantities of antimony, copper, gem stones, lead, silver, stone, and tungsten also were produced during the year. No production of clays or tin was recorded in 1956.

**Prospecting and Exploration.**—Prospecting and exploration in Alaska remained active in 1956. According to the Territorial Department of Mines, nearly $4 million was spent by major companies in a search for mineral deposits in Alaska, an 18-percent increase over 1955. Several large American oil companies continued drilling in the Birchwood, Icy Bay, and Goose Bay areas.

A molybdenum prospect near Canyon Creek in the Nizina district, Copper River region, was staked and explored. Interest in prospecting for radioactive minerals continued high; activity was concentrated in the Southeastern Alaska region, where two major discoveries were made on Prince of Wales Island.

Two companies searched for nonmetallic-mineral deposits. Northern Pyrites Co. drilled a promising sulfide body at Latouche Island in the Prince William Sound district, Copper River region. British Columbia Mica Co. was developing mica deposits on Sitklan Island, south of Ketchikan, Southeastern Alaska region and reported that results of the work were favorable.

Digitized by Google

TABLE 2.—Expenditures for exploration and prospecting by major companies in Alaska, 1955–56 [1]

| Type and region | Expenditures | |
|---|---|---|
| | 1955 | 1956 |
| Metals exploration: | | |
| Southeastern | $280,000 | $656,000 |
| Copper River | 75,000 | 245,000 |
| Kuskokwim and Yukon River | 140,000 | 95,000 |
| Northwestern | 10,000 | ---------- |
| Oil and gas exploration: | | |
| All areas | 2,865,000 | 2,980,000 |
| Total | 3,370,000 | 3,976,000 |

[1] Compiled by Phil R. Holdsworth, Commissioner of Mines, Territory of Alaska.

**Government Programs.**—The Defense Minerals Exploration Administration (DMEA) continued to participate in exploration for mercury, copper, nickel-copper, tungsten-lead-zinc, and tungsten deposits in Alaska in 1956. Total Government assistance to Alaska's mineral industry through DMEA contracts dropped to $764,000 in 1956 from $1.1 million in 1955. The decrease resulted from termination or completion of contracts with United States Tin Corp., A. L. Howard, and Earl R. Pilgrim for tin, platinum, and antimony, respectively; remaining contracts were increased $79,000. Alaska's only chromite producer—Kenai Chrome Co.—again sold its output to the General Services Administration (GSA).

**Transportation.**—Lack of commodities to provide a back haul to the United States kept Alaska's transportation rates among the highest in the world in 1956. Air transportation was highly developed but economically feasible only for ores and minerals having high unit value. Steamship-rail rates for mining machinery, explosives, diesel oil, and food remained stable compared with 1955.

The Alaska Road Commission continued work on the Denali Highway, a 102-mile route that will connect Mount McKinley Park with the Richardson Highway at Paxson; at present, access to the park is by railroad or airplane only. The Taylor Highway, also under construction in 1956, will open new areas between Tetlin Junction on the Alaska Highway and Eagle to motor transportation and will provide a connection with Canadian routes through Dawson, Yukon Territory.

In September the Alaska Road Commission was absorbed by the Bureau of Public Roads, United States Department of Commerce. This action will permit the Territory of Alaska to benefit from the Federal Highway Aid Act, Public Law 672. It is anticipated that the new law will result in an expanded road system, which in turn will open additional land to more thorough mineral examination.

The high cost of transportation has been a major deterrent to development of a mining industry in Alaska and is illustrated by two shipments of antimony ore made by Earl R. Pilgrim from his Stampede mine, Kantishna district, Yukon River region. The first shipment—30 tons—was hauled over snow by tractor sleds to Lignite, on the Alaska Railroad; 700 gallons of diesel fuel was consumed on this

Digitized by Google

**TABLE 3.—Defense Minerals Exploration Administration activities in Alaska, 1956**

| Region and contractor | District | Location | Property | Commodity [1] | Contract | | Government participation (percent) |
|---|---|---|---|---|---|---|---|
| | | | | | Date | Total amount | |
| BRISTOL BAY | | | | | | | |
| Moneta Porcupine Mines, Ltd | Bristol Bay | Marsh Mountain | Red Top | Mercury | Aug. 18, 1955 | $118,720 | 75 |
| COOK INLET-SUSITNA | | | | | | | |
| Alaska Copper Mines, Inc | Valdez Creek | MacLaren River | Kathleen-Margaret | Copper | Apr. 2, 1954 | 41,530 | 50 |
| KUSKOKWIM RIVER | | | | | | | |
| DeCoursey Mountain Mining Co | Aniak | North of Crooked Creek. | DeCoursey | Mercury | June 2, 1953 | 81,000 | 75 |
| Do | do | West of Sleitmute | Red Devil | do | June 2, 1953 | 231,232 | 75 |
| SOUTHEASTERN ALASKA | | | | | | | |
| Admiralty-Alaska Gold Mining Co | Admiralty | Funter Bay | Mertie Lode | Nickel-copper | Sept. 14, 1951 | [2] 142,692 | 90 |
| Hyder Mines, Inc | Hyder | North of Hyder | Riverside | Tungsten-lead-zinc | May 3, 1954 | [3] 96,120 | 62½ |
| YUKON RIVER | | | | | | | |
| Alaska Metals Mining Co., Inc | Fairbanks | Gilmore Dome | Yellow Pup | Tungsten | Sept. 28, 1954 | 52,308 | 75 |

[1] All contracts were for lode deposits. [2] Contract closed April 1956. [3] Inactive entire year.

Digitized by Google

50-mile trip. The combined rail-steamship charge from Lignite to Seattle, Wash., was $36.67 per net ton; the rate from Seattle to Kobe, Japan, including terminal charges at Kobe, $32.33; and delivery to the steamer from the original carrier and outboard charges at Seattle, $3.70—a total cost of $72.70 per ton, excluding tractor-sled expenses.

The second shipment was made to the eastern United States at transportation costs as follows: Air transportation from the mine at Stampede to Nenana (on the Alaska Railroad), $37.57 per net ton; trucking from plane to railroad plus rail and steamship charges from Nenana to San Francisco, $40.87; and trucking from San Francisco to Oakland plus steamship charges from Oakland to Baltimore, Md., $30.78—a total cost from Stampede to the east coast of $122.22 per ton. The cost from Nenana to San Francisco—a distance of approximately 3,000 miles—was 55 percent more than the cost for the trip from Oakland, Calif., to the east coast—a distance of approximately 6,000 miles.

**Labor.**—During 1956, 170 mines (exclusive of sand and gravel pits) and 2 ore-dressing plants, employing 1,591 men, were active. The mines operated an average of 196 days. The short working period resulted from climatic conditions and necessitated working the men as many or more overtime hours at premium pay as at regular pay. In industries covered by the Employment Security Act (companies having 4 or more employees working at least 20 weeks during the year), the average work week ranged from 48 hours in the coal mines of the Anchorage area to 63 hours in the gold mines of the Fairbanks area. Most coal mines operate throughout the year.

**TABLE 4.—Employment and injuries in Alaska mines, 1956, by types of mines [1]**

| Type of mine | Number of men working (average) | Average number of days worked [2] | Man days | Injuries (number) | |
|---|---|---|---|---|---|
| | | | | Fatal | Nonfatal |
| Metal mines: | | | | | |
| Lode | 90 | 132 | 11,910 | 1 | 28 |
| Mills | 39 | 335 | 13,075 | ---- | 16 |
| Placer: | | | | | |
| Dredges | 767 | 224 | 171,889 | ---- | [3] 100 |
| Nonfloat | 273 | 104 | 28,383 | ---- | 9 |
| Hydraulic | 29 | 92 | 2,659 | ---- | ---- |
| Small-scale hand | 17 | 61 | 1,035 | ---- | ---- |
| Quarries and mills | 61 | 83 | 5,058 | ---- | 4 |
| Coal mines | 315 | 246 | 77,432 | ---- | 72 |
| Total | 1,591 | 196 | 311,441 | 1 | 229 |

[1] Excludes prospecting, purely investigational work, and sand and gravel operations but includes assessment and development work.
[2] Calculated.
[3] Includes 3 permanent partial injuries.

The mining industry competed for manpower with the construction industry, which operated during the same season. Wages paid to mining personnel were governed largely by wages agreed upon by Associated General Contractors of America and international and local trade unions affiliated with the building and construction trades, CIO–AFL. A few mining companies that have provided steady (although seasonal) employment were able to obtain labor at substantially lower wages than construction-industry wages. One com-

Digitized by Google

TABLE 5.—Wage rates in selected occupations, 1956 [1]

| Occupation | Wage rates [2] | |
|---|---|---|
| | Interior | Southeastern Alaska |
| Bulldozer operator | $3.98 | $3.98 |
| Drilling-machine operator (core) | 4.33 | 4.33 |
| Shovel and dragline operators | $4.38–4.69 | $4.38–4.69 |
| Miners (tunnel) | 3.80–3.85 | 3.62–3.67 |
| Powderman | 3.54–3.95 | 3.36–3.77 |
| Timberman | 3.80 | 3.62 |
| General labor | 3.48 | 3.29 |

[1] Agreement between Associated General Contractors of America and the building trades unions, CIO-AFL.
[2] In addition, the employer must pay 10 cents per hour to the union welfare fund; food and lodging must be provided at a charge not to exceed $5.75 per day.

pany, which has been a steady employer for more than 20 years, obtained personnel at wages ranging from $1.63 per hour for stripping-crew laborers to $2.24 per hour for dredge winchmen. This company also used some of its labor force to maintain and repair equipment during the winter.

Wages in Alaska were higher than in the United States because of the higher cost of living. The Alaska Agricultural Experiment Station and Alaska Extension Service reported that the cost of a typical market basket, as of December 1956, was $10.65 in Seattle (100 percent), $13.31 in Juneau (125 percent), $15.19 in Anchorage (143 percent), and $16.24 in Fairbanks (152 percent).

## REVIEW BY MINERAL COMMODITIES

### METALS

**Antimony.**—Earl R. Pilgrim continued to be the only Alaskan antimony producer. He reported 2 shipments of ore from his Stampede mine during 1956—1 to Kobe, Japan, and the other to Baltimore, Md. The ore was mined before 1956.

**Chromium.**—Kenai Chrome Co. produced shipping-grade crude ore from the Star Four mine on Red Mountain in the Homer district, Kenai Peninsula region, at about the same rate as in 1955. The company began constructing a mill to treat lower grade ore, but heavy snows prevented its completion before the end of 1956.

The chromite deposits in the Kenai Peninsula have been known at least since 1906, but production has been sporadic. In 1917—under the stimulus of World War I prices—approximately 1,000 short tons of ore averaging 46 to 49 percent $Cr_2O_3$ was mined, and in 1918 an additional 1,000 tons averaging 40 percent $Cr_2O_3$ was produced. Most of this output was sold to refractory companies. In 1931 approximately 10 tons of ore was sent to the United States for test purposes. No further activity was noted until 1942, when the Chrome Queen Mining Co. of Seldovia constructed bunkhouses, cookhouses, and shops and began development work on the Chrome Queen mine. In 1943–44 this mine produced 7,400 short tons of crude ore, which was delivered to a Government stockpile on Jackalof Bay; the ore was still there in 1956.

Digitized by Google

The Kenai Chrome Co. began development work on the Star Four mine in 1953 and production in 1954.

**Copper.**—Less than 1 ton of copper, recovered as a secondary metal from a shipment of gold ore and from concentrates shipped in previous years, was marketed from Alaska in 1956. The gold ore was produced during exploration and development at the East Point mine in Kenai Peninsula region.

Several mining companies continued prospecting and exploration in search of commercial copper deposits. Bear Creek Mining Co. (Kennecott Copper Co. subsidiary) used a helicopter to prospect the Prince William Sound area. Texas Gulf Sulfur Co. resumed geophysical and diamond-drill investigations of copper-bearing iron sulfide deposits on Latouche Island. The Federal Bureau of Mines did diamond drilling on a similar deposit at Ellamar. Kodiak Exploration Co. accomplished assessment work and prospected 15 copper claims on Sitkalidak Island near Kodiak. Exploration, partly under a DMEA contract, was continued on the Admiralty-Alaska Gold Mining Co. nickel-copper lode deposit at Funter Bay.

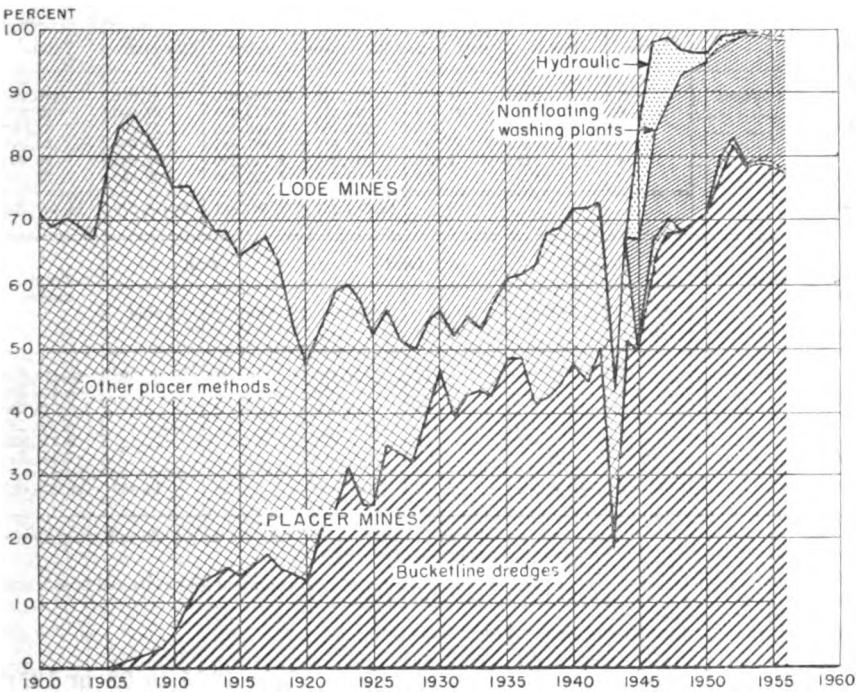



FIGURE 2.—Percentage of total Alaska gold produced at lode and placer mines and by various methods of placer mining, 1900–1956; "other placer methods" includes hydraulic and nonfloating washing plants for which separate data are not available before 1943.

The Bureau of Mines completed laboratory investigation of copper-bearing ores from the Moth Bay, Threeman, and Golden Zone mines and the Kathleen-Margaret prospect.[5] These ores proved amenable to beneficiation, primarily by flotation methods.

[5] Wells, R. R., Laboratory Concentration of Various Alaska Copper Ores: Bureau of Mines Rept. of Investigations 5245, 1956, 9 pp.

Digitized by Google

**Gold.**—The mines of Alaska yielded 16 percent less gold in 1956 than in 1955. The decline in output resulted from a steady rise in operating costs and a consequent drop in the number of nonfloating placer plants from 91 in 1955 to 76 in 1956. The quantity of gold produced by nonfloating operations decreased 13 percent compared with 1955. A nonfloating placer plant is one in which the gravel is delivered to sluiceboxes on bedrock or to elevated sluiceboxes with bulldozer or dragline excavation equipment. To compensate for increased costs, operators mined more selectively, and the average value of the ground worked rose from 53 cents per cubic yard in 1955 to 68 cents in 1956. Many operators who had exhausted higher grade material ceased operations, as they were unwilling to assume the expense of preparing additional ground or moving equipment to new working sites.

**TABLE 6.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total 1880–1956, in terms of recoverable metals [1]**

| Year | Mines producing | | Material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 16 | 223 | 34,256 | 257,342 | $9,006,970 | 51,011 | $46,168 |
| 1952 | 6 | 119 | 11,459 | 240,557 | 8,419,495 | 32,986 | 29,854 |
| 1953 | 3 | 148 | 475 | 253,783 | 8,882,405 | 35,387 | 32,027 |
| 1954 | 5 | 146 | 19,747 | 248,511 | 8,697,885 | 33,697 | 30,497 |
| 1955 | 4 | 142 | 3,884 | 249,294 | 8,725,290 | 33,693 | 30,494 |
| 1956 | 3 | 120 | 265 | [3] 209,296 | 7,325,360 | [3] 28,360 | 25,667 |
| 1880–1956 | | | (4) | 28,644,251 | 714,580,841 | 20,188,579 | 14,457,425 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 8 | $3,308 | 163 | $51,485 | 11 | $2,893 | $9,110,824 |
| 1952 | | | 1 | 322 | | | 8,449,671 |
| 1953 | | | 9 | 2,358 | | | 8,916,790 |
| 1954 | 4 | 2,360 | | | | | 8,730,742 |
| 1955 | 1 | 746 | 1 | 298 | | | 8,756,828 |
| 1956 | (5) | (5) | [3] 1 | 314 | | | 7,351,341 |
| 1880–1956 | 685,910 | 226,889,964 | 25,753 | 3,029,366 | 56 | 14,466 | 958,972,062 |

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore shipped to smelters during calendar year indicated.
[2] Does not include gravel washed.
[3] Includes 901 fine ounces of gold, 211 fine ounces of silver, and 1,147 pounds of lead recovered from a mill cleanup and from ore and concentrates at 3 inactive properties.
[4] Figures not available.
[5] Less than 1 ton; quantity and value not included in total.

The number of active dredges rose from 17 in 1955 to 22 in 1956 and the number of dredge operators from 10 to 13. Although the quantity of gravel washed by dredges increased 12 percent in 1956, the quantity of gold recovered declined 17 percent. The value of ground handled by dredges dropped from 62 cents per cubic yard in 1955 to 46 cents in 1956.

Digitized by Google

**TABLE 7.—Fifteen leading gold-producing mines in 1956, in order of output**

| Rank | Mine | District | Region | Rank in 1955 | Operator | Source of gold |
|---|---|---|---|---|---|---|
| 1 | Fairbanks unit | Fairbanks | Yukon River | 1 | United States Smelting, Refining & Mining Co | Dredges (6). |
| 2 | Nome unit | Nome | Seward Peninsula | 2 | do | Do. (2). |
| 3 | Nyac | Aniak | Kuskokwim River | 3 | New York Alaska Gold Dredging Corp | Do. (3). |
| 4 | Coal Creek | Circle | Yukon River | 4 | Gold Placers, Inc | Do. |
| 5 | Flat Creek | Iditarod | do | 6 | North American Dredging Co | Do. (2). |
| 6 | Eureka Creek | Hot Springs | do | 15 | Strandberg & Sons | Nonfloat. |
| 7 | Colorado Creek | Innoko | do | 11 | do | Do. |
| 8 | Livengood Creek | Tolovana | do | (1) | Yukon Placer Mining, Inc | Do. |
| 9 | Wolf Creek | Fairbanks | do | (1) | Wolf Creek Mining Co | Do. |
| 10 | Poorman Creek | Ruby | do | 12 | Miscovich Bros | Do. |
| 11 | Otter Creek | Iditarod | do | (1) | Otter Dredging Co | Dredge. |
| 12 | Fairbanks Creek | Fairbanks | do | 9 | Alder Creek Mining Co | Nonfloat. |
| 13 | Olive Creek | Tolovana | do | 13 | Olive Creek Mines | Do. |
| 14 | Candle Creek | Fairhaven | Seward Peninsula | 7 | Havenstrite Oil Co | Do. |
| 15 | Colorado Creek | McGrath | Kuskokwim River | (1) | Colorado Creek Mining Co | Do. |

[1] Not among the 15 highest in 1955.

Digitized by Google

**TABLE 8.—Gold produced at placer mines 1947–51 (average), 1952–56, and total, 1880–1956, by classes of mines and methods of recovery**

| Class and method | Mines producing [1] | Washing plants | Material treated (cubic yards) | Gold recovered | | |
|---|---|---|---|---|---|---|
| | | | | Fine ounces | Value | Average value per cubic yard |
| Surface placers: | | | | | | |
| Gravel mechanically handled: | | | | | | |
| Bucketline dredges: | | | | | | |
| 1947–51 (average) | 20 | 27 | 12,295,000 | 182,025 | $6,370,875 | $0.518 |
| 1952 | 14 | 23 | 13,470,000 | 198,524 | 6,948,340 | .516 |
| 1953 | 14 | 23 | 14,080,000 | 197,701 | 6,919,535 | .491 |
| 1954 | 14 | 24 | 11,936,100 | 196,028 | 6,860,980 | .575 |
| 1955 | 10 | 17 | 11,030,100 | 194,131 | 6,794,585 | .616 |
| 1956 | 13 | 22 | 12,350,400 | 161,410 | 5,649,350 | .457 |
| Dragline dredges: | | | | | | |
| 1947–51 (average) | [2] | [2] | 29,600 | 743 | 26,005 | .879 |
| Nonfloating washing plants: [3] | | | | | | |
| 1947–51 (average) | 100 | 100 | 3,608,500 | 55,098 | 1,928,430 | .534 |
| 1952 | 78 | 78 | 2,137,000 | 39,661 | 1,388,135 | .650 |
| 1953 | 87 | 87 | 3,591,000 | 53,991 | 1,889,685 | .526 |
| 1954 | 85 | 85 | 2,866,300 | 48,880 | 1,710,800 | .597 |
| 1955 | 90 | 91 | 3,390,000 | 51,023 | 1,785,805 | .527 |
| 1956 | 76 | 76 | 2,295,200 | 44,533 | 1,558,655 | .679 |
| Gravel hydraulically handled: | | | | | | |
| 1947–51 (average) | 54 | ..... | 829,060 | 12,249 | 428,715 | .517 |
| 1952 | 9 | ..... | 39,000 | 660 | 23,100 | .592 |
| 1953 | 14 | ..... | 36,000 | 820 | 28,700 | .797 |
| 1954 | 17 | ..... | 97,400 | 1,481 | 51,835 | .532 |
| 1955 | 15 | ..... | 58,900 | 908 | 31,780 | .540 |
| 1956 | 14 | ..... | 24,100 | 866 | 30,310 | 1.258 |
| Small-scale hand methods (wet): | | | | | | |
| 1947–51 (average) | 45 | ..... | 38,050 | 946 | 33,110 | .870 |
| 1952 | 17 | ..... | 16,400 | 422 | 14,770 | .901 |
| 1953 | 33 | ..... | 17,000 | 604 | 21,140 | 1.244 |
| 1954 | 29 | ..... | 30,400 | 1,106 | 38,710 | 1.273 |
| 1955 | 25 | ..... | 35,200 | 898 | 31,430 | .893 |
| 1956 | 17 | ..... | 22,000 | 724 | 25,340 | 1.152 |
| Underground placers (drift): | | | | | | |
| 1947–51 (average) | 4 | ..... | 790 | 134 | 4,690 | 5.937 |
| 1952 | 1 | ..... | 600 | 23 | 805 | 1.342 |
| 1953 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1954 | 1 | ..... | 200 | 14 | 490 | 2.450 |
| 1955 | 2 | ..... | 400 | 42 | 1,470 | 3.675 |
| 1956 | ..... | ..... | ..... | ..... | ..... | ..... |
| Grand total placers: | | | | | | |
| 1947–51 (average) | 223 | ..... | 16,801,000 | 251,194 | 8,791,790 | .523 |
| 1952 | 119 | ..... | 15,663,000 | 239,390 | 8,375,150 | .535 |
| 1953 | 148 | ..... | 17,724,000 | 253,116 | 8,859,060 | .500 |
| 1954 | 146 | ..... | 14,930,400 | 247,509 | 8,662,815 | .580 |
| 1955 | 142 | ..... | 14,514,600 | 247,002 | 8,645,070 | .596 |
| 1956 | 120 | ..... | 14,691,700 | 207,533 | 7,263,655 | .494 |
| 1880–1956 | ..... | ..... | [4] | [4] | [5] 496,549,407 | [4] |

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] No dragline dredges reported 1948–56; data shown separately for 1945–47 only and for previous years included under "Other placers."
[3] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable outfit is termed "dryland dredge."
[4] Complete data not available.
[5] Data for 1880–1936 from published records of the Federal Geological Survey.

Digitized by Google

**TABLE 9.—Mine production of gold, silver, copper, and lead in 1956, by months, in terms of recoverable metals [1]**

| Month | Gold (fine ounces) | Silver (fine ounces) | Lead (short tons) | Month | Gold (fine ounces) | Silver (fine ounces) | Lead (short tons) |
|---|---|---|---|---|---|---|---|
| January | | | | August | 44,096 | 6,115 | |
| February | | | | September | 39,670 | 5,566 | |
| March | 431 | 47 | | October | 35,326 | 4,906 | |
| April | 42 | 7 | | November | 26,855 | 3,538 | |
| May | 7,813 | 1,013 | | December | 6,636 | 963 | [2] 1 |
| June | 17,852 | 2,224 | | | | | |
| July | 30,575 | 3,981 | | Total | 209,296 | 28,360 | 1 |

[1] Derived mostly from mint and smelter receipts; data are adjusted to exclude receipts during the first part of 1956 previously credited to 1955 production and to include expected receipts in 1957 which are part of actual output in 1956; no zinc produced in 1956; data for copper (less than 1 ton) not included in totals.
[2] Includes all smelter receipts of lead produced in 1956.

**TABLE 10.—Mine production of gold, silver, and lead in 1956, by regions, in terms of recoverable metals [1]**

| Region | Mines producing | | Gold (lode and placer) | | Silver (lode and placer) | | Lead | | Total value |
|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | Fine ounces | Value | Fine ounces | Value | Pounds | Value | |
| Cook Inlet-Susitna | 1 | 7 | 1,684 | $58,940 | 269 | $243 | (2) | (2) | $59,183 |
| Copper River | | 1 | 81 | 2,835 | 15 | 14 | | | 2,849 |
| Kenai Peninsula | 1 | | 815 | 28,525 | 226 | 205 | | | 28,730 |
| Kuskokwim River and Northwestern Alaska | | 10 | 17,812 | 623,420 | 1,870 | 1,692 | | | 625,112 |
| Seward Peninsula | | 22 | 28,000 | 980,000 | 3,106 | 2,811 | | | 982,811 |
| Southeastern Alaska [3] | (4) | 3 | 872 | 30,520 | 209 | 189 | [5] 2,000 | [5] $314 | 31,023 |
| Yukon River | 1 | 77 | 160,032 | 5,601,120 | 22,665 | 20,513 | (2) | (2) | 5,621,633 |
| Total | 3 | 120 | 209,296 | 7,325,360 | 28,360 | 25,667 | 2,000 | 314 | 7,351,341 |

[1] No zinc produced in 1956; quantity and value of copper (less than 1 ton) not included in region or Alaska totals.
[2] Quantity and value of lead included with Southeastern Alaska region.
[3] Includes 901 fine ounces of gold, 211 fine ounces of silver, and 1,147 pounds of lead recovered from a mill cleanup and from ore and concentrate shipped in 1956 from 3 inactive properties.
[4] No producing mine; mill cleanup at 1 inactive property.
[5] Includes quantity and value of lead from Cook Inlet-Susitna and Yukon River regions.

The increase in the number of dredges and dredging operations apparently reflected the judgment of some companies that gold could be mined profitably by handling larger quantities of lower grade material. However, one major dredging company reported that it continued operations only because the heavy capital investment in equipment, flumes, powerhouses, and development made it more economical to take a small operating loss than to shut down and absorb a heavy maintenance cost.

In all, 120 placer mines and 3 lode mines were active in 1956 compared with 142 and 4, respectively, in 1955. Placer mines continued to be the major source of gold in Alaska. The 76 mines utilizing nonfloating washing plants produced 21 percent of the gold output, dredge operations yielded 77 percent, and 14 hydraulic and 17 small-

Digitized by Google

**TABLE 11.—Mine production of gold, silver, copper, and lead in 1956, by regions and districts, in terms of recoverable metals [1]**

| Region and district [2] | Mines producing [3] | | Ore and old tailings (short tons) | Gold (fine ounces) | | | Silver (fine ounces) | | | Copper (pounds) | Lead (pounds) | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Lode | Placer | Total | Lode | Placer | Total | | | |
| Cook Inlet-Susitna region: | | | | | | | | | | | | |
| Valdez Creek | 1 | | 52 | 113 | | 113 | 18 | | 18 | (4) | (5) | [6] $3,971 |
| Yentna | | 7 | | | 1,571 | 1,571 | | 251 | 251 | | | 55,212 |
| Copper River region: | | | | | | | | | | | | |
| Nelchina | | 1 | | | 81 | 81 | | 15 | 15 | | | 2,849 |
| Kenai Peninsula region: | | | | | | | | | | | | |
| Hope | 1 | | 194 | 815 | | 815 | 226 | | 226 | (4) | | 28,730 |
| Kuskokwim River region: | | | | | | | | | | | | |
| Aniak | | 5 | | | 16,465 | 16,465 | | 1,694 | 1,694 | | | 577,808 |
| Seward Peninsula region: | | | | | | | | | | | | |
| Council | | 2 | | | 971 | 971 | | 101 | 101 | | | 34,076 |
| Fairhaven | | 6 | | | 2,296 | 2,296 | | 320 | 320 | | | 80,050 |
| Kougarok | | 6 | | | 609 | 609 | | 47 | 47 | | | 21,358 |
| Koyuk | | 1 | | | 66 | 66 | | 9 | 9 | | | 2,318 |
| Nome | | 7 | | | 24,058 | 24,058 | | 2,629 | 2,629 | | | 844,409 |
| Southeastern Alaska region: | | | | | | | | | | | | |
| Juneau | (6) | 2 | (7) | 834 | 37 | 871 | 200 | 8 | 208 | (4) | [6] 2,000 | [6] 30,987 |
| Ketchikan | | 1 | | | 1 | 1 | | 1 | 1 | | | 36 |
| Yukon River region: | | | | | | | | | | | | |
| Circle | | 10 | | | 8,411 | 8,411 | | 1,143 | 1,143 | | | 295,419 |
| Eagle | | 1 | | | 371 | 371 | | 40 | 40 | | | 13,021 |
| Fairbanks | 1 | 13 | 1 | 1 | 115,174 | 115,175 | 122 | 15,918 | 16,040 | | (5) | [6] 4,045,642 |
| Fortymile | | 10 | | | 1,230 | 1,230 | | 241 | 241 | | | 43,268 |
| Hot Springs | | 6 | | | 4,217 | 4,217 | | 1,164 | 1,164 | | | 148,648 |
| Iditarod | | 7 | | | 8,784 | 8,784 | | 1,225 | 1,225 | | | 308,549 |
| Innoko | | 8 | | | 6,887 | 6,887 | | 882 | 882 | | | 241,843 |
| Kantishna | | 1 | | | 308 | 308 | | 223 | 223 | | | 10,982 |
| Koyukuk | | 3 | | | 364 | 364 | | 32 | 32 | | | 12,769 |
| Marshall | | (8) | | | 85 | 85 | | 11 | 11 | | | 2,985 |
| Mclozitna | | (8) | | | 842 | 842 | | 78 | 78 | | | 29,541 |
| Rampart | | 6 | | | 773 | 773 | | 57 | 57 | | | 27,107 |
| Ruby | | 4 | | | 4,761 | 4,761 | | 753 | 753 | | | 167,317 |
| Tolovana | | 5 | | | 4,883 | 4,883 | | 444 | 444 | | | 171,307 |
| Other districts [10] | | 8 | | | 4,288 | 4,288 | | 508 | 508 | | | 150,539 |
| Total [11] | 3 | 120 | 247 | 1,763 | 207,533 | 209,296 | 566 | 27,794 | 28,360 | (4) | 2,000 | 7,351,341 |

[1] No zinc produced in 1956; quantity and value of copper not included in district or Alaska totals (see footnote 4).
[2] Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; others producing are listed in footnote 10 and their output included with "Other districts."
[3] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[4] Less than 1 ton (see footnote 1).
[5] Quantity and value of lead included with Juneau district, Southeastern Alaska region.
[6] No producing mine; mill cleanup at 1 inactive mine.
[7] Ore reported in prior years; concentrates and bullion shipped in 1956.
[8] No producing mine; production was before but not reported until 1956.
[9] Includes quantity and value of lead from Cook Inlet-Susitna and Yukon River regions.
[10] Includes the following districts for which quantities and values cannot be shown separately (number of operations in parenthesis): Bethel (1), Goodnews Bay (2), McGrath (1), Kuskokwim River region; Shungnak (1), Northwestern Alaska region; Chandalar (1), Chisana (1), Hughes (1), Yukon River region.
[11] Includes quantities and values of gold, silver, and lead

Digitized by Google

**TABLE 12.—Equipment used at placer-gold mines in Alaska, 1956, by regions**

| Region | Number of operations | Gravel washed (cubic yards) [1] | Equipment used (number) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Bulldozers | Drag-lines | Hydraulic giants | Dredges | Other [2] |
| Cook Inlet-Susitna | 7 | 77,800 | 6 | 1 | 5 | | |
| Copper River | 1 | 300 | 1 | | | | |
| Kuskokwim River | 9 | 1,334,400 | 5 | 3 | 3 | 3 | |
| Northwestern Alaska | 1 | 18,400 | 1 | | | | |
| Seward Peninsula | 22 | 2,869,800 | 38 | 4 | 23 | 8 | 4 |
| Southeastern Alaska [3] | 3 | 1,200 | | | | | |
| Yukon River | 77 | 10,389,800 | 103 | 24 | 213 | 11 | 10 |
| Total | 120 | 14,691,700 | 154 | 32 | 244 | 22 | 14 |

[1] Partly estimated.
[2] Includes hydraulic elevators, power shovels, pumping units, and dryland dredges.
[3] All small-scale hand operations; no mechanical equipment required.

scale hand operations (no drift placers were active) 1 percent. In 1955 there were 15 hydraulic, 25 small-scale hand, and 2 drift placer mines. The remaining 1 percent of the 1956 production was contributed by lode mines.

Output from lode mines included small quantities of gold from the East Point mine of Patrick W. Bogan and George Massoz, Hope district, Kenai Peninsula region; Black Creek mine of Bott Bros. & Coffield, Valdez Creek district, Cook Inlet-Susitna region; and Alaska Juneau Gold Mining Co., Juneau district, Southeastern Alaska region (mill cleanup). The Black Creek mine of Bott Bros. & Coffield may increase its output upon completion of the Denali Highway connecting the mine to the Richardson Highway and tidewater at Valdez. A small recovery of gold also was reported by Fred M. Wackwitz from lead ore produced at the Flume Creek-Fox Gulch mine, Fairbanks district, Yukon River region.

The Fairbanks district, Yukon River region, continued to be the major gold-producing area in Alaska. United States Smelting, Refining & Mining Co., was again the largest gold producer in Alaska, operating 6 dredges at Fairbanks and 2 at Nome. The company continued reassembling its dredge on the Hogatza River, a tributary of the Koyukuk River, Koyukuk district; it planned to operate its new dredge at Nome, completed by the Yuba Manufacturing Co., in 1957. The company also continued stripping, preparatory to dredging, on Chicken Creek, Fortymile district, Yukon River region.

Placer-mine operators reported that 1,405 ounces of natural gold (nuggets, grains, and dust that had not been melted or amalgamated) was sold to buyers and jewelers. Prices were reported to be $3 to $5 an ounce above the mint price. The major nugget-producing areas were the Fortymile district, Yukon River region, and the Yenta district, Cook Inlet-Susitna region.

**Iron Ore.**—No commercial iron ore was shipped from Alaska in 1956. The tempo of exploration remained at a high level, however, because of the proximity of Alaska iron deposits to the United States west coast and the Orient.

Columbia Iron Mining Co., a subsidiary of United States Steel Corp., constructed a pilot mill for testing and concentrating placer material at Klukwan, near Haines. The company shipped 1,500



Digitized by Google

tons of ore for use in metallurgical tests during the year. Columbia Iron Mining Co. operated the deposit under an agreement with Klukwan Iron Ore Co., owner of more than 100 unpatented claims near Klukwan Indian Village, 23 miles north of Haines. The United States Steel Corp. subsidiary also drilled at Union Bay, at Cleveland Peninsula, and on Duke Island.

Owen Ore Co., Utah Company of the Americas, J. R. Simplot Co., and others were active in exploration, primarily in the Southeastern Alaska region.

The Bureau of Mines published a report on the magnetite deposits of the Snettisham Peninsula, 30 miles southeast of Juneau. The Bureau's study indicated a substantial reserve of titanium-bearing iron ore from which a concentrate meeting blast-furnace specifications could be produced by beneficiation.[6]

Alaska Juneau Gold Mining Co., the Alaska Railroad, and General Metals of the Aleutians, Inc., shipped scrap metal.

**Lead.**—A shipment of sulfide concentrate, recovered from gold ore milled in previous years by the Alaska Juneau Gold Mining Co., yielded a small quantity of lead. In addition, Fred M. Wackwitz shipped a small quantity of lead ore from Flume Creek in the Fairbanks district, Yukon River region. The concentrate and ore were sent to smelters in the United States. Little prospecting or exploration for lead deposits was done in Alaska in 1956.

**Mercury.**—DeCoursey Mountain Mining Co., Inc., resumed production at the Red Devil mine near Sleitmute, Aniak district, Kuskokwim River region, in March 1956, after repairing damage caused by a fire late in 1954. The only other mercury producer in Alaska was Russel R. Schaefer, operator of the Broken Shovel mine, also in the Aniak district. Production from these mines was sold to buyers in the United States and to local gold-placer operators.

Exploration for mercury was continued by Moneta Porcupine Mines, Ltd., with DMEA cooperation at the Red Top Mercury property in the Bristol Bay region. DeCoursey Mountain Mining Co. also had an active DMEA contract to conduct exploration at the DeCoursey Mountain and Red Devil mines. George H. Willis and Robert Lyman continued prospecting and exploration at the Alice and Bessie mine, Aniak district.

**TABLE 13.—Production of mercury, 1947–51 (average) and 1952–56**

| Year | Producing mines | 76-pound flasks | Price [1] (per flask) | Value |
|---|---|---|---|---|
| 1947–51 (average) [2] | 1 | 65 | $106.22 | $6,904 |
| 1952 | 1 | 28 | 199.10 | 5,575 |
| 1953 | 2 | 40 | 193.03 | 7,721 |
| 1954 | 2 | 1,046 | 264.39 | 276,552 |
| 1955 | 1 | (3) | 290.35 | (3) |
| 1956 | 2 | 3,280 | 259.92 | 852,538 |

[1] Value calculated at average New York price.
[2] No production in 1950–51.
[3] Figure withheld to avoid disclosing individual company confidential data.

[6] Thorne, R. L., and Wells, R. R., Studies of the Snettisham Magnetite Deposit, Southeastern Alaska: Bureau of Mines Rept. of Investigations 5195, 1956, 41 pp.

Digitized by Google

The Bureau of Mines released a report containing the results of tests of cinnabar-stibnite ore from the Red Devil mine in 1956.[7]

**Nickel.**—Admiralty-Alaska Gold Mining Co. continued development at a nickel-copper deposit at Funter Bay, Admiralty Island, Southeastern Alaska region. This work, which had been financed under the DMEA program, proceeded with private capital after completion of the DMEA contract. Equipment was purchased to continue several thousand feet of diamond drilling and 5,000 feet of drifts, an aerial magnetometer survey was conducted over adjacent property, and applications were filed for patents on additional claims.

**Platinum-Group Metals.**—The Goodnews Bay Mining Co. recovered platinum-group metals by placer-mining methods on the Salmon River, Kuskokwim River region.

**Silver.**—All of the silver produced in Alaska in 1956, as in previous years, was a byproduct of gold output; 98 percent of the silver came from placer-gold operations and the remainder from lode mines. Production of silver from Alaska mines in 1956 declined 16 percent as a result of the decline in gold production. The leading gold producers were also the major silver producers; United States Smelting, Refining & Mining Co., the principal producer, recovered silver as a byproduct of gold dredging in the Fairbanks district, Yukon River region, and in the Nome district, Seward Peninsula region.

**Tungsten.**—No tungsten ore or concentrate was shipped from Alaska mines in 1956. During the year, Alaska Metals Mining Co. installed a 25-ton mill at the Yellow Pup mine, Fairbanks district, Yukon River region. The mill was operated 2 weeks on ore mined in 1955. A small quantity of tungsten concentrate also was recovered as a byproduct of gold placer mining by Rocky Mountain Mining Co., Nome district, Seward Peninsula region. Early in October Kodiak Exploration Co. began diamond drilling on its properties on Kodiak Island.

**Uranium.**—Interest in uranium prospecting remained high during the year. Much prospecting was preceded by aerial reconnaissance with radiation detection equipment. Ground parties then attempted to confirm airborne anomalies and to stake claims.

Exploration and development continued on several promising prospects. Climax Molybdenum Co. did diamond drilling on the Ross-Adams property, Prince of Wales Island, Ketchikan district. This property and the I & L Co. group of claims explored by the Union Carbide Nuclear Co. are reported to show considerable promise.

## MINERAL FUELS

**Coal.**—Production of bituminous coal in Alaska in 1956, increased 14 percent over 1955, as a result of increased use by military installations. Most of the coal was used for heat and power at Ladd and Eielson Air Force bases near Fairbanks and at Fort Richardson and Elmendorf Air Force Base in the Anchorage area. The Air Force operated two new powerplants in 1956; the north plant at Ladd Air Force Base and the west plant at Elmendorf Air Force Base. In

[7] Erspamer, E. G., and Wells, R. R., Selective Extraction of Mercury and Antimony From Cinnabar-Stibnite Ore: Bureau of Mines Rept. of Investigations 5243, 1956, 15 pp.

Digitized by Google

addition, a new Air Force hospital and numerous small installations were supplied with heat and power by Fort Richardson. Production not used by military establishments was sold to local utilities for the production of heat and power and for domestic heating and cooking. Retail prices in Anchorage and Fairbanks were approximately $24 per ton.

In 1956, 7 coal companies operated 5 underground and 5 strip mines. Production continued to come from three fields: Matanuska, Cook Inlet-Susitna region; Nenana, Yukon River region; and Point Barrow, Northern Alaska region. Most of the underground production was shot from the solid or cut by hand. Two continuous miners were used in 1956, one by Usibelli mine of the Usibelli Coal Mines, Inc., and the other by the Jonesville mine of the Evan Jones Coal Co.

**TABLE 14.—Production of coal, 1955–56, by fields**

| Field | Short tons | |
|---|---|---|
| | 1955 | 1956 |
| Matanuska | 257,548 | 269,067 |
| Nenana | 381,048 | 456,533 |
| Barrow | 1,100 | 1,201 |
| Total | 639,696 | 726,801 |

Mechanization of coal loading increased in 1956; 53 percent of the underground production was mechanically loaded, compared with 27 percent in 1955. Six mobile loaders, 13 scraper loaders, 5 duckbills or self-loading conveyors, and 6 hand-loaded conveyors were used in 1956, compared with 5 mobile loaders, 2 scraper loaders, and 6 hand-loaded conveyors in 1955.

The average value at the tipple of coal mined underground was $9 per ton, compared with $9.94 per ton in 1955. The average value of strip-mined coal increased from $8.44 per ton in 1955 to $8.64 per ton in 1956.

Despite the decrease in the number of active strip pits in Alaska, surface mining accounted for 64 percent of the total coal produced in the Territory, compared with 63 percent in 1955. Of total coal output, 47 percent was cleaned. Cleaning plants were operated by Evans Jones Coal Co., Mrak Coal Co., and Pioneer Mining Co., Inc., all in the Matanuska field, and by Usibelli Coal Mining Co., Inc., Nenana field.

**Petroleum and Natural Gas.**—No commercial production of crude petroleum or natural gas was reported in Alaska in 1956; however, the naval base at Point Barrow continued to use a small quantity of natural gas from one of the wells drilled during the Navy's exploration program on Naval Petroleum Reserve No. 4, Northern Alaska region.

Increased activity was noted in the search for oil in 1956. Major American oil companies and groups of individuals obtained leases that brought the total acreage under exploration and prospecting near the 5-million mark. Several companies continued drilling programs, but no conclusive results were announced. Phillips Petroleum Co. drilled in the Katalla area; Anchorage Gas & Oil Development Co., near

Digitized by Google

Houston, 30 miles north of Anchorage; and Havenstrite Oil Co. at Iniskin Bay, Cook Inlet-Susitna region.

Considerable interest was shown by major American oil companies in the Moose Range area of the Kenai Peninsula. A total of nearly 2 million acres was leased by Phillips Petroleum Co., Union Oil Co., Ohio Oil Co., Sunray Mid-Continent Oil Co., Shell Oil Corp., Standard Oil of California, General Petroleum Corp., and Richfield Oil Co. Special agreements were made with the Secretary of the Interior, stipulating the conditions governing prospecting and exploration, by companies leasing more than 100,000 acres. The Kateel River area, 300 miles west of Fairbanks, also was the scene of increased prospecting for oil. Texota Oil Co. completed geologic reconnaissance and mapping of 1 million acres in the area in preparation for drilling in 1957. To facilitate the filing of leases, the Bureau of Land Management established a new guide meridian, the Kateel River meridian.

## NONMETALS

**Clays.**—Basic Building Products, Inc., did not operate its Eagle River and Sheep Mountain clay pits in 1956. The shutdowns resulted from an excessive raw-material stockpile at the company Anchorage brick plant, reported to be caused by operational difficulties rather than decreased demand for brick.

**Gem Stones.**—The Alaska gem-stone industry reported difficulty in obtaining gem-quality jade in 1956. Jade suitable for the manufacture of bookends was plentiful.

Shungnak Jade Products, Shungnak, Kobuk River district, Northwestern Alaska region, continued to purchase jade from the Eskimos. The project, Eskimo-operated but sponsored by the Alaska Native Service, continued to cut, polish, and shape jade for souvenirs and jewelry. The entire output was marketed through the Alaska Native Arts and Crafts Association, a Native Service affiliate. During 1956 the association announced its incorporation into a private organization for marketing art pieces and souvenirs produced by the Alaskan Eskimo and Indian population. Empire Jade Co., Kotzebue, continued to send part of its raw jade to Germany for cutting and polishing. The company reportedly found a jade nugget estimated at 20 tons; disposition of the nugget was undetermined at the end of 1956. Alaska Jade Co., Fairbanks, formerly Alaska Handicrafters, cut and polished jade purchased in previous years.

Plasma and petrified wood from the Aleutian Islands were processed by Norton's Gem Shop in Seward. Small quantities of agate and petrified wood were collected, cut, and polished for jewelry by Alaska Lapidary Service in Baranof, Southeastern Alaska region.

**Sand and Gravel.**—Production of sand and gravel declined 39 percent in 1956 compared with 1955. The completion of many building projects by the United States Army Corps of Engineers, as well as a reduction in road construction by the Bureau of Public Roads and the Alaska Road Commission, appreciably lowered requirements for sand and gravel.

Seven commercial and five Government or contractor producers were active in Alaska in 1956. The major producers were the Bureau of Public Roads (including the Alaska Road Commission) and the

Digitized by Google

United States Army Corps of Engineers. The Alaska Road Commission was absorbed by the Bureau of Public Roads in September 1956; this step will permit the Territory of Alaska to benefit from the provisions of the Federal Road Building Act. Of the total sand and gravel output, 87 percent was produced by Government agencies or their contractors, compared with 85 percent in 1955. The production of special paving materials increased the average value of sand and gravel from 84 cents in 1955 to 99 cents per ton in 1956.

**TABLE 15.—Sand and gravel sold or used by producers, 1955–56, by uses**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Sand: | | | | |
| Structural | 166,363 | $360,740 | 104,115 | $298,376 |
| Paving | 228,119 | 361,850 | 187,567 | 344,843 |
| Blast | 270 | 300 | ---------- | ---------- |
| Engine | 405 | 1,800 | ---------- | ---------- |
| Filter | 40 | 45 | ---------- | ---------- |
| Other | 3,780 | 6,450 | 4,800 | 44,150 |
| Gravel: | | | | |
| Structural | 612,995 | 856,401 | 148,593 | 406,754 |
| Paving | 7,880,784 | 6,097,048 | 5,012,339 | 4,268,516 |
| Railroad ballast | 384,121 | 285,359 | 131,356 | 117,572 |
| Other | 516,337 | 272,351 | 366,335 | 399,588 |
| Total | 9,793,214 | 8,242,344 | 5,955,105 | 5,879,799 |

**Stone.**—All of Alaska's stone quarries were operated by Government agencies or their contractors. Major producers were the United States Army Corps of Engineers, the 17th Naval District, and the Alaska Railroad which is an agency within the United States Department of the Interior.

Stone output declined 27 percent in 1956 compared with 1955, primarily because of a decline in heavy construction which used riprap for breakwaters, causeways, and foundations.

The decrease in output was not paralleled by a corresponding decrease in total value. The average value of stone produced in Alaska jumped from $1 per ton in 1955 to $3.05 per ton in 1956, resulting in a 105 percent increase in total value. The rise in average value was due to production from isolated, high-cost installations, such as the Adak Naval Station in the Aleutian Islands.

**TABLE 16.—Stone sold or used by producers, 1955–56, by uses**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Crushed and broken: | | | | |
| Riprap | 229,011 | $248,029 | 148,103 | $350,591 |
| Concrete and road stone | 8,726 | 17,000 | 36,457 | 215,525 |
| Other | 28,003 | 24,560 | 10,304 | 28,778 |
| Total | 265,740 | 289,589 | 194,864 | 594,894 |

Digitized by Google

## REVIEW BY REGIONS

Regions and districts used in this report conform to a pattern previously established; boundaries are defined in a report published in 1954.[8]

**Alaska Peninsula, Aleutian Islands, Bering Sea.**—Mineral-industry activity increased in the Aleutian Islands during 1956. Sand and gravel produced by personnel of the 17th Naval District was used for military projects. Construction of an early warning radar system in 1957 on the island chain was expected to augment the demand for these products still more. General Metals of the Aleutians, Inc., recovered scrap metal from military supplies left on the islands during World War II. Exploration for oil was begun by Shell Oil Corp. on 100,000 acres leased in 1955 near Wide Bay, Alaska Peninsula region. No mineral-industry activity was reported in the Bering Sea region during 1956.

**Bristol Bay.**—Moneta Porcupine Mines, Ltd., continued exploration on Red Top Mercury Mines property near Aleknagik. The mercury deposits were leased in 1955 from the owners, Frank Waskey, Clarence Wren, James Putvin, and Charles Wolfe. Moneta Porcupine Mines, Ltd., completed nearly 500 feet of drifts and crosscuts during the year under a DMEA contract. It was anticipated that known reserves would be increased by future development on another level. Sand and gravel produced by the United States Army Corps of Engineers was the only mineral commodity marketed in the region in 1956.

**Cook Inlet-Susitna.**—The value of coal produced in the Cook Inlet-Susitna region increased 7 percent over 1955. The rise in value was due to a 4-percent increase in tonnage mined and an increase in value per ton ($12.16 per ton in 1956, compared with $11.86 per ton in 1955).

The Havenstrite Oil Co. concluded an unsuccessful drilling program at Iniskin Bay, Redoubt district. The company planned further exploration in the same area. Anchorage Gas & Oil Development Co. continued drilling an 86,000-acre block of leases near Houston, 30 miles north of Anchorage.

Production of sand and gravel increased 8 percent in quantity and 11 percent in value over 1955. Nearly two-thirds of the output was produced under Government contract for use in military construction by the United States Army Corps of Engineers. The balance was produced for commercial consumption in building, railroad ballast, and unspecified uses.

Basic Building Products Co., a subsidiary of Anchorage Sand & Gravel Co., manufactured building and refractory brick from clay mined in previous years. No clay was mined from the company's Sheep Mountain and Eagle River deposits in 1956.

The construction of the Denali Highway (75 percent complete) through the Valdez Creek district was expected to stimulate prospecting in this heavily mineralized area. Bott Bros. and Coffield partnership milled 50 tons of gold ore in a 2-ton Gibson prospect mill. The ore was mined from the Denali lode claim at Black Creek mine.

[8] Ransome, Alfred L., Kerns, William H., Names and Definitions of Regions, Districts, and Subdistricts in Alaska: Bureau of Mines Inf. Circ. 7679, 1954, 91 pp.

Digitized by Google

TABLE 17.—Value of mineral production in Alaska, 1955–56, by regions [1]

| Region | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Aleutian Islands | | $152,000 | Stone, sand and gravel. |
| Bristol Bay | $10,200 | 88,800 | Sand and gravel. |
| Cook Inlet-Susitna | 5,115,559 | 5,229,028 | Coal, sand and gravel, gold, stone, silver. |
| Copper River | 3,163,758 | 1,586,282 | Sand and gravel, stone, gold, silver. |
| Kenai Peninsula | 833,618 | 976,871 | Chromite, sand and gravel, gold, silver. |
| Kodiak | 141,360 | 248,538 | Sand and gravel, stone. |
| Kuskokwim River | 2,256,397 | 3,079,009 | Platinum-group metals, mercury, gold, silver, stone, sand and gravel. |
| Northern Alaska | 14,400 | 46,000 | Coal. |
| Northwestern Alaska | 81,030 | 152,831 | Sand and gravel, gold, gem stones, silver. |
| Seward Peninsula | 1,200,770 | 982,811 | Gold, silver. |
| Southeastern Alaska | 229,667 | 580,106 | Stone, sand and gravel, gold, gem stones, silver, lead. |
| Yukon River | 12,365,089 | 10,285,690 | Gold, coal, sand and gravel, silver, antimony. |
| Total Alaska | 25,412,000 | 23,408,000 | |

[1] No mineral production from Alaska Peninsula and Bering Sea regions.

Preliminary investigation by the Federal Bureau of Mines of the Beluga River coal deposit near Tyonek in the Redoubt district indicated a large reserve of coal. The feasibility of strip-mining the coal, using it for power generation at the mine, and transmitting the power to the Anchorage area was being studied by Territorial agencies.

*Willow Creek District.*—Evan Jones Coal Co. continued to be the leading coal producer in the Matanuska field. Underground and strip mines, operated by the company at Jonesville, yielded 29 percent of the coal produced in Alaska. Pioneer Mining Co., Inc., did not operate its underground mine; production by the company came from the Premier strip mine. Mrak Coal Co. contributed a substantial percentage of the district's coal production from surface operations at the Eska mine.

Brown & Renshaw partnership did not operate the Gold Cord mine in 1956. The only activity at this lode was assessment work on unpatented claims.

*Yentna District.*—The quantity of gold recovered by Collinsville Mines at the Mills Creek nonfloating placer decreased to 1,216 fine ounces in 1956 from 4,267 fine ounces in 1955. The company was forced to shut down in midseason because the tenor of the ground being worked dropped below the cutoff point. The future of the company was undecided. Smaller quantities of gold were produced at placer mines operated by Robert Dahl, Cache Creek; Gagnon Placers and J. F. Nasenius, Big Willow Creek; Harold Stanton, Upper Falls Creek; and Hickok-Engelhorn, Thunder Creek. Depletion of profitable placer ground and rising costs of labor and equipment contributed to the decline in gold production in the district. At many mines only the assessment work required to hold claims was done.

**Copper River.**—The value of minerals produced in the Copper River region decreased 50 percent from the 1955 output. The value of sand and gravel used by the construction industry dropped 89 percent below that reported in 1955. Gold output in the region was the lowest in more than 10 years; only 1 mine (5 in 1955) produced gold. George Belanger and Jack Cameron partnership recovered 81 fine ounces of gold by placer mining at Albert Creek, Nelchina district,

Digitized by Google

using a bulldozer to move 300 cubic yards of gold-bearing gravel through a nonfloating washing plant. Other placer mines in the region did only assessment or development work.

Phillips Petroleum Co. began to drill its third exploratory well in the Icy Bay area, Yakataga district. Two other wells drilled in the same area were not commercially productive and were capped. Interest in potential oil deposits in the area was shown by Colorado Oil & Gas Co., which completed seismic and gravimetric surveys on leases near the Phillips property in 1956. Equipment required for drilling in 1957 was moved into the area.

**Kenai Peninsula.**—Chromite mined by the Kenai Chrome Co. continued to be the leading mineral, in value, produced in the Kenai Peninsula region. The value of chromite shipments represented 73 percent of the value of all minerals produced in the region. Increased production at one lode-gold mine in the Hope district more than doubled the 1955 output.

Many major American oil companies explored for oil in the Kenai-Moose Range. Nearly 2,225,000 acres is leased by Phillips Petroleum Co., Union Oil Co., Ohio Oil Co., Sunray-Midcontinent Oil Co., Shell Oil Corp., Standard Oil of California, General Petroleum Co., and Richfield Oil Co. The last-named company began building a 20-mile road into the Swanson River area to its drilling site.

*Homer District.*—Mining by the Kenai Chrome Co. at Star 4 mine produced 6,422 long tons of chromite. The ore was purchased by GSA and shipped by barge to Seattle, destined for the Grants Pass (Oreg.) Depot. The mining property on Red Mountain near Seldovia was operated a short season because of heavy snow accumulation and inclement weather; the mine produced from July 1 to October 30. Plans to complete and operate a $70,000 mill were interrupted by an extremely heavy snowfall. The company intended to complete the mill by mid 1957 and to stockpile enough ore to keep it operating in the winter.

*Hope District.*—Patrick W. Bogan and George Massoz shipped 174 short tons of gold ore from their East Point lode mine. The ore, treated by the American Smelting and Refining Co. smelter at Tacoma, yielded 760 fine ounces of gold, 210 fine ounces of silver, and 220 pounds of copper. Additional gold was recovered by amalgamation and deposited with the Denver Mint. The value of minerals recovered from ore mined by drifting and stoping increased 240 percent over 1955.

**Kodiak.**—The only mineral commodities produced in the Kodiak region were sand and gravel and stone. The output came from pits and quarries of the 17th Naval District at Adak and Kodiak, worked by contractors for the United States Army Corps of Engineers.

Kodiak Exploration Co., formed in 1955 by G. H. Cornelius and H. Lawhead, began what was believed to be the first diamond drilling on Kodiak Island. The company explored tungsten and copper properties on Kodiak and Sitkalidak Islands, respectively.

**Kuskokwim River.**—Platinum-group metals mined by Goodnews Bay Mining Co., Goodnews Bay district, continued to rank first in value of all minerals produced in the region. Full-scale mercury production was resumed by the DeCoursey Mountain Mining Co., Aniak

Digitized by Google

district, in March, after replacement of the roasting plant and other surface buildings destroyed by a fire in late 1954. Output was expected to set a new production record for Alaska mercury. Approximately 17,200 fine ounces of gold was produced by 9 operations in the region. New York-Alaska Gold Dredging Co., Aniak district, was again the region's largest producer.

The Federal Bureau of Mines investigated mercury deposits in the Kuskokwim River basin. The project, recessed because of inclement weather, was to be resumed when the weather permitted.

*Aniak District.*—Over 3,000 flasks of mercury were produced at the DeCoursey Mountain Mining Co. Red Devil mine from ore processed in a 40-ton Herreshoff-type roasting plant. The mercury was sold to Mercantile Metal & Ore Corp., New York, and Otter Dredging Co., Flat, Alaska. Russel R. Schaefer recovered a small quantity of mercury from ore mined at Broken Shovel mine, Cinnabar Creek. A total of 16,465 fine ounces of gold was recovered by New York-Alaska Gold Dredging Co., Nyac; Marvel Creek Mining Co., Marvel Creek; Ralph Garrison, Granite Creek; Donlin Placers, Snow Gulch; and Jens Kvamme, Canyon Creek.

*Goodnews Bay District.*—Goodnews Bay Mining Co., the only primary producer of platinum-group metals in the United States or its Territories, operated a bucketline dredge and a nonfloating washing plant on Salmon River near Platinum. Gold and silver were recovered as byproducts of platinum production.

*McGrath District.*—Leonard Zaiser, Birch Gulch, was the only active gold producer in the district.

**Northern Alaska.**—Coal and a small quantity of natural gas were produced in the Northern Alaska region. Meade River coal mine, operated by Ed Burnell, sold 1,201 tons of coal to residents of Barrow for use in heating and cooking. The coal was transported to the town by "cat train." A small quantity of natural gas from a well on the naval petroleum reserve also was used in Barrow.

**Northwestern Alaska.**—Dahl Creek Mines (C. E. Stout) was the only gold producer in the Northwestern Alaska region. The company used nonfloating methods to recover gold at its Dahl Creek placer. The gold was sold to Northern Commercial Co., Fairbanks. Small quantities of jade were selected from detritus in the Shungnak district. The jade was used in manufacturing jewelry.

**Seward Peninsula.**—Gold production in the Seward Peninsula region declined approximately 1,000 fine ounces compared with 1955. The Nome district, as in previous years, yielded the largest percentage (86 percent) of the gold output of the region. Yuba Manufacturing Co. completed rebuilding the United States Smelting, Refining & Mining Co. dredge that overturned in 1954. The Federal Bureau of Mines searched for the lode source of placer tin in the Brooks Mountain-Potato Mountain area. Work on the project was recessed late in the year because of inclement weather. Silver, recovered as a byproduct of gold placer operations, was the only other mineral produced in the region.

*Council District.*—Last Chance Mining Co., idle in 1955, operated a bucketline dredge on Eldorado Creek. During the mining season—August 12 to October 2—the company recovered 111 fine ounces of

Digitized by Google

gold from 3,500 cubic yards of gravel. Northern Mining Co. operated its dredge on the Niukluk River and recovered 860 fine ounces of gold and 90 fine ounces of silver. Development work was done by Ralph Murane on the Golden Nugget claims on Daniels Creek. Pancake Mining Co. did assessment and stripping on placer claims on Pancake Creek.

*Fairhaven District.*—Havenstrite Oil Co., Mining Division, operated a nonfloating placer mine on Candle Creek and recovered a substantial quantity of gold. Inmachuck Mining Co. (Grant H. Nelson, owner) extracted 303 fine ounces of gold from 75,000 cubic yards of gold-bearing gravel processed by dredging. The company purchased the Casa DePaga Gold Co. dredge, which it expected to operate in 1957. The other gold producers in the district were Otto F. Weinard, Mud Creek; Paul Beshore & Associates, Kugruk River; Roy Mendenhall, Milroy Creek; and Jack Hoogendorn, Inmachuck River.

*Kougarok District.*—N. B. Tweet & Sons, largest gold producer in the district, extracted 508 fine ounces of gold from gravel treated in a nonfloating washing plant. Gold was recovered at placer operations of Atlas Mines, Dahl Creek; George Bodis, Bryan Creek; Midnight Sun Mines, Miller Creek; Rainbow Mining Co., Grouse Creek; and Andrew Wirum, Dome Creek. Lucky Syndicate of Portland, Oreg., purchased a dredge from the Gold Dust Mining Co., which had been idle for several years.

*Koyuk District.*—Patrick J. Bliss and Carl Swanson operated placer mines at Sweepstakes and Dime Creeks, respectively. Patrick J. Bliss also purchased the Ungalik Syndicate placer claims on Ungalik River. Oscar Swanson did assessment work on his placer claims at Dime Creek.

*Nome District.*—United States Smelting, Refining & Mining Co., Nome unit, operated two dredges from May 8 to November 8 and extracted the largest quantity of gold produced in the district. The company planned to operate a third dredge in the district in 1957.

Lee Bros. Dredging Co., second ranking producer in the Nome district in 1956 (idle in 1955), operated a bucketline dredge on Solomon Creek and recovered a substantial quantity of gold.

On Basin Creek, Herbert Engstrom used a power shovel to deliver gold-bearing gravel to elevated sluiceboxes. Mining yielded 252 fine ounces of gold and 143 ounces of natural gold, which was sold on the open market.

Kougarok Freight & Mining Co., on Buster Creek, recovered gold from old placer tailing with a homemade flume-type dredge; 234 fine ounces of gold was extracted during the mining season.

Other gold producers in the district were Bale & Lindfors, Iron Creek; Rocky Mountain Mining Co., Rocky Mountain Creek; and Jack John Titus, Penny Creek.

**Southeastern Alaska.**—The total value of mineral production in the region in 1956 was 2½ times that in 1955 and, in order of value, comprised stone, sand and gravel, gold, gem stones, lead, silver, and copper. A noteworthy increase in stone production was due to riprap produced by the United States Army Corps of Engineers at Metlakatla and Petersburg for use in the development of small boat basins. Although the quantity of sand and gravel produced in the region decreased 53 percent, the value increased 34 percent compared

Digitized by Google

with 1955. A special preparation used for seal coat in asphalt paving largely explained the increase in value. Most of the production was used in Government-financed projects. Besides gem stones and a small quantity of gold recovered by two placer operators near Haines, gold, silver, copper, and lead were produced by the Alaska Juneau Gold Mining Co. from a mill cleanup and from a shipment of concentrate (recovered in previous years).

Nearly $750,000 was reported to have been spent on prospecting and exploration in the Southeastern Alaska region in an accelerated search for iron, nickel, copper, uranium, molybdenum, barite, limestone, and oil. Active among the mining and oil companies were Union Carbide Nuclear Co. and Climax Molybdenum Co., searching for uranium; Columbia Iron Mining Co. (United States Steel Corp. subsidiary), Quebec Metallurgical Industries, Ltd., and Owen Ore Co. (W. S. Moore subsidiary), searching for iron ore; and Colorado Oil & Gas Corp. and Phillips Petroleum Co., searching for oil.

*Admiralty District.*—Diamond drilling was done by Admiralty-Alaska Gold Mining Co. on nickel-copper deposits at Funter Bay, Admiralty Island. The exploration, partly financed under the DMEA program, was being expanded to include 4,000 feet of drifting on the 1,425- and 1,700-foot levels. New equipment was ordered to support the enlarged program.

*Juneau District.*—The year marked the end of a gold producer known throughout the mining world. The new management of Alaska Juneau Gold Mining Co. voted to cease all operations at the Juneau property. Plans were made to dismantle mine and mill equipment for sale to foreign markets. The company plans to retain title to its mining claims. From 1893 until it shut down in 1944, the Alaska Juneau mine yielded nearly $81 million in gold, silver, copper, and lead. The company was famous for its profitable, mass-production method of mining low-grade gold ore.

Alaska Juneau Gold Mining Co. was formed on the basis of lode discoveries on placer claims staked by Joe Juneau and Richard Harris, the founders of the present city of Juneau. These two men discovered placer gravels at the mouth of Gold Creek in 1880.

*Ketchikan District.*—Exploration and development activity in the Ketchikan district increased during 1956. Union Carbide Nuclear Co. leased the I and L uranium prospect at Kendrick Bay. The company completed a 1½-mile road from the beach to the property and did diamond drilling to check mineralization. Climax Molybdenum Co. continued investigating uranium property leased from Ross & Adams. Kendrick Bay Mining Co. was formed by Climax Molybdenum Co., Ross, and Adams to exploit the deposit near Moira Sound. Development outlined enough reserves to warrant mining.

Aluminum Company of America leased its Edna Bay limestone holdings to Edna Bay Pure Stone Co., a Texas corporation. The new company planned to quarry the limestone and ship it to a lime plant to be constructed near Vancouver, Wash. Northwest Ventures, Ltd., of Vancouver, British Columbia, did diamond drilling on copper deposits on Gravina Island near Ketchikan.

Totem Exploration Co., Inc., was formed by a group of Ketchikan residents. The company planned to prospect and do diamond drilling

Digitized by Google

for contracted prices or for a percentage of the profits of future operations.

British Columbia Mica Mines explored on Sitklan Island, east of Ketchikan.

*Yakutat District.*—Colorado Oil & Gas Co., Denver, Colo., purchased the oil leases of Yakutat Development Co. along the Gulf of Alaska, enlarging its holdings to 1.2 million acres in the Yakutat area. Preparations were being made for drilling.

**Yukon River.**—The total value of mineral commodities produced in the Yukon River region declined 17 percent compared with 1955. Lower output of sand and gravel and gold (46 and 17 percent, respectively) caused the decline in value. The value of coal produced increased 14 percent, partly offsetting the loss. Because of the lower tenor of available placer ground, mechanized mining methods were necessary to increase the quantity of gravel processed. In 1956 an average of 67 cubic yards of gravel was treated to yield 1 fine ounce of gold; 50 cubic yards yielded 1 ounce in 1955.

The quantity of gold produced by 77 placer mines (94 in 1955) comprised 76 percent of the total value of gold recovered in Alaska. Five companies operated 11 bucketline dredges to recover 75 percent of the gold marketed from the region.

Earl R. Pilgrim & Co. resumed mining at its antimony mine in the Kantishna district. Pilgrim's Stampede mine made two shipments of high-grade antimony ore mined in previous years.

In the Bonnifield district 2 strip and 2 underground mines produced 63 percent of the coal mined—48 percent of the value of coal sold in Alaska.

Considerable interest was shown in potential oil deposits in the Kateel River area, 300 miles northwest of Fairbanks. During the year, applications for oil leases on 1,225,000 acres were filed by companies and individuals. Texota Oil Co. planned drilling on oil lands leased in the area.

*Bonnifield District.*—The coal output in the Yukon River region came from mines operated by 3 companies (4 in 1955). Usibelli Coal Mine, Inc., largest coal producer in the Nenana field, operated a strip and an underground mine on Healy River. Coal mined by the company was cleaned in a dense-medium cleaning plant. Suntrana Mining Co., the second ranking coal producer in the field, operated an underground mine at Healy; the third operator, Arctic Coal Co., produced coal from a strip mine at Lignite. Lack of a military contract forced the Cripple Creek Coal Co. to remain idle.

*Chandalar District.*—Chandalar Mining Co., the only active placer in the district, recovered a substantial quantity of gold from gravel processed in a nonfloating washing plant at Big Creek.

*Chisana District.*—A new mine operated by Hobb Enterprises extracted considerable gold by nonfloating placer methods on Slate Creek. This mine was the only gold producer in the district.

*Circle District.*—Gold Placers, Inc. (Ernest N. Patty, president), operated a bucketline dredge on Coal Creek and was the major gold producer in the district. A bulldozer removed overburden in advance of the dredge. P. R. & H. Mining Co., second-ranking gold producer, operated nonfloating washing plants at Mastodon and Mammoth

Digitized by Google

Creeks. Walter Roman operated the Lucky Seven Mining Co. placer mine on Mastodon Creek and recovered 495 fine ounces of gold and 138 fine ounces of silver. Bulldozers delivered gravel to bedrock sluiceboxes. John Frasca and W. L. Hering recovered 227 fine ounces of gold from 20,000 cubic yards of gravel. The gold was recovered in bedrock sluiceboxes on Eagle Creek claims.

Other placer operators in the Circle district were Paul Bittner, Deadwood Creek; Heine C. Carstens and Delta Alaska Co., Portage Creek; Jens Langlow, Switch Creek; and Miller Creek Mining Co. and Robert R. Wilkinson, Miller Creek. Timberline Placers (K. C. Spaid and H. L. Stout), a substantial gold producer in 1955, was idle.

*Eagle District.*—The only active mine operator in Eagle district, Lucky 8 Mining Co., recovered gold by placer mining at Crooked Creek. Wallace T. Brown and Burnett F. Hansen recovered 371 fine ounces of gold and 40 fine ounces of silver from the company sluiceboxes. Bulldozers delivered gravel and stacked tailing at the nonfloating operation.

*Fairbanks District.*—Although the number of placer mines decreased from 22 in 1955 to 13 in 1956, the quantity of gold produced in the Fairbanks district was 55 percent (59 percent in 1955) of the total Alaska output.

The Fairbanks unit of United States Smelting, Refining & Mining Co. (six bucket line dredges) continued to be the leading gold producer in Alaska. The company operated dredges at Gold Hill and on Cripple, Engineer, Pedro, Fairbanks, Dome, and Chatinika Creeks.

Wolf Creek Mining Co. used nonfloating equipment to mine 10 placer claims on Wolf Creek. This company ranked second in output of gold from the Fairbanks district. Alder Creek Mining Co., Fairbanks Creek, recovered 2,022 fine ounces of gold and 280 fine ounces of silver from 35,500 cubic yards of gravel delivered to elevated sluiceboxes by 2 dragline excavators. Dragline excavators and bulldozers stripped overburden and removed tailing.

Cliff Mining Co. operated a diesel-powered dredge on Caribou Creek during the mining season, June 1 to September 16. The company recovered 511 fine ounces of gold and 45 fine ounces of silver from 200,000 cubic yards of gravel. Chatham Creek Mining Co., Chatham Creek, recovered a substantial quantity of gold from placer mines.

Hassel Mining Co. used hydraulic giants, bulldozers, and dragline excavators to move 16,296 cubic yards of gravel; 1,002 fine ounces of gold and 226 fine ounces of silver were recovered from the placer mine on Ready Bullion Creek.

Gold was recovered by nonfloating placer-mining methods by Robert V. Watkins at Hope Mine, Faith Creek; Ketchum Creek Mining Co. (Al Swatch), Ketchum Creek; Bill Lawrence, Nugget Creek; Ernest L. Maurer, First Chance Creek; No Grub Mining Co., No Grub Creek; and Sleeper & McCharles, Buckeye Creek.

Placer operations that yielded gold in 1955 but were inactive in 1956 included Gold Stream Mining Co. (Denny G. Breaid), Goldstream Creek; Helmer Johnson, Cleary Creek; Albert Patrick, Ester Creek; and Fred Wackwitz, Bedrock Creek, who made a test shipment

Digitized by Google

of lead-silver ore to the Selby smelter in California from his Flume Creek lode mine.

Alaska Metals Mining Co. installed a small mill at the Gilmore Dome tungsten property near Fairbanks. The mill operated 2 weeks before an early freeze curtailed activity. During the 2-week period, 1,800 pounds of tungsten concentrate was extracted from 47 tons of ore mined in 1955. The company worked under a DMEA contract.

*Fortymile District.*—Rambaud & Hank (Rambaud & Weaver in 1955) recovered 112 fine counces of gold from placer mines on Napoleon Creek. Hydraulic giants removed 11,555 cubic yards of overburden during the mining season, April 20, to September 12. Gold was recovered from 4,340 cubic yards of gravel delivered to sluiceboxes by bulldozers. In addition to selling 112 fine ounces of gold to the San Francisco Mint, the partnership sold 423 ounces of natural gold on the open market.

Placer mining by William Meldrum on Stonehouse Creek yielded 172 fine ounces of gold and 36 fine ounces of silver. Hydraulic giants were used to strip 8,000 cubic yards of overburden, and a bulldozer delivered 4,000 cubic yards of gold-bearing gravel to the sluiceboxes.

Engbret Johansen operated a placer mine on Ingle Creek and recovered 59 fine ounces of gold during the mining season. Two hydraulic giants washed gold-bearing gravel through bedrock sluiceboxes and removed tailing.

Other placer operators in the district were Purdy Bros., Myers Fork; Al Cunningham, Rock Creek; Franklin Mining Co. (Roberts Bros.), Chicken Creek; Jack LaCross & Fred Whitehead, Poker Creek and Walker Fork; Squaw Creek Mining Co., Canyon Creek; George F. Robinson, Jack Wade Creek; and Dan Manske, Ingle Creek.

United States Smelting, Refining & Mining Co. continued preparatory work on dredging ground at Mosquito Fork. Robert McComb started stripping on gold claims near the South Fork of Fortymile River.

*Hot Springs District.*—Strandberg & Sons, principal gold producer in the Hot Springs district, operated a placer mine on Eureka Creek. Johnson & Isaacson, also on Eureka Creek, used hydraulic giants and bulldozers to deliver gold-bearing gravel to a 24-inch by 60-foot bedrock sluicebox; the partnership operated from May 1 to September 20.

Tony Lanning & Stanley Dayo operated nonfloating placer mines on Omega and Thanksgiving Creeks. Gravel processed at both mines yielded 186 fine ounces of gold. The partnership stripped overburden with a hydraulic giant and delivered gravel to the sluiceboxes with a TD–14 bulldozer.

Other placer mines in the district were operated by Oscar Enstrom (formerly Enstrom & McDougall), New York Gulch, and A. W. Pringle, Rhode Island Creek. Both used nonfloating placer-mining methods to recover gold.

*Hughes District.*—Strandberg & Sons, the only active placer operator in the Hughes district in 1956, used nonfloating methods to recover considerable gold on Indian River. The company also leased the L. J. James mining claims on Felix Fork.

*Iditarod District.*—North American Dredging Co. (Alex Mathiesen, owner), the leading producer of gold in the district, operated two

Digitized by Google

bucketline dredges at Glen Association claims on Flat Creek. Otter Dredging Co., also using a dredge on Otter Creek, ranked second in gold production in the district. Miscovich Bros. recovered gold by nonfloating methods from a placer mine on Otter Creek.

Gust Backstrom operated Idaho mine on Flat Creek from May 15 through August 15, using 2 hydraulic giants to wash 1,300 cubic yards of gravel, which yielded 92 fine ounces of gold. The property was sold to John S. Stevens at the end of the mining season.

Prince Creek Mining Co., Prince Creek, stripped overburden and delivered gravel to sluiceboxes with 1 bulldozer and 3 hydraulic giants. A substantial quantity of gold was recovered from 13,000 cubic yards of gravel. Other gold placers in the district were the hydraulic operations of Julian Stuver on Happy and Alpha Creeks.

*Innoko District.*—The Fullerton Bros.' Colorado Creek Mining Co. washed 75,000 cubic yards of gravel through elevated sluiceboxes to recover 1,405 fine ounces of gold. The mine on Colorado Creek was operated from June 1 to September 27. A dragline excavator and 2 D–8 bulldozers removed 150,000 cubic yards of overburden ahead of washing.

Strandberg & Sons also mined on Colorado Creek. This company used its dryland dredge (a portable, nonfloating washing plant) to extract the largest quantity of gold recovered by any mine in the district.

On Little Creek, Ivor C. Carlson washed 5,000 cubic yards of gravel through sluiceboxes from June 1 to September 27; the gold-bearing gravel yielded 268 fine ounces of gold and 50 fine ounces of silver. Degnan Mining Co., Esperanto Creek, and Uotila & Hard, Ophir Creek, recovered considerable gold by nonfloating methods.

A placer mine operated by Hjalmer Lindquist on Bedrock and Ester Creeks yielded 171 fine ounces of gold. The gold was extracted from 3,700 cubic yards of gravel washed through a bedrock sluicebox by 3 hydraulic giants. The hydraulic giants and a TD–18 bulldozer were used to strip overburden. Eric Hard operated Humming Bird Creek placer mine; this nonfloating operation produced a small quantity of gold. Waino Puntila, Little Creek, used a combination of a dragline excavator and hydraulic giants to wash 5,000 cubic yards of gold-bearing gravel through bedrock sluiceboxes.

Ophir Mining Co., which recovered more than 1,000 fine ounces of gold from dredge operations in 1955, was idle. The dredging ground leased by the company reverted to the owners, Ganes Mining Co. and Innoko Dredging Co.

*Kantishna District.*—Earl R. Pilgrim made two shipments of antimony ore from Stampede mine. Considerable difficulty was encountered in transporting the ore by tractor-drawn sleds to the railhead at Lignite. Underground mining, recessed since 1954, was resumed late in the year. The only gold-producing property in the district was the placer mine operated by Paul Omlin on Little Moose Creek. Dewey Burnette and M. Hunter did assessment work on their Crooked Creek placer claims.

*Koyukuk District.*—Gold recovered in the district came from gravel processed by three placer-mine operators. Emma Mining Co. (Gus Uotila, Guy Rivers, Carl Poorman, and Weldon McIntosh) used two

Digitized by Google

D–8 bulldozers to deliver gold-bearing gravel to sluiceboxes. The company recovered 306 fine ounces of gold, which was sold to the San Francisco Mint. In addition, 115 ounces of natural gold was sold on the open market. Other gold placers in the district were operated by Harry Leonard, Smith Creek; and Stanich Bros. (Sam and Obren), Porcupine Creek. Myrtle Creek Mining Co. leased its placer claims to Prospectors, Inc.

*Melozitna District.*—Gold produced in the Melozitna district came from the Grant Creek placer mine operated by Grant Mining Co. Gold recovered in the nonfloating washing plant was deposited in the San Francisco Mint.

*Rampart District.*—Melo Jackovich recovered 151 fine ounces of gold from a placer mine on Hunter Creek. Two bulldozers stripped overburden, delivered gravel to sluiceboxes, and stacked tailing. Other active mine operators in the district included the T & T Mining Co., Hunter Creek, and Weisner Trading Co., Little Minook Jr. Creek (bulldozers delivered gravel to sluiceboxes and hydraulic giants or removed overburden and stacked tailing); and Harry F. Havrilack (nonfloating placer); and Sam Barton (prospecting), Little Minook Jr. and Big Minook Creeks.

Little Minook Mining Co. was idle in 1956; the company leased its gold placer claims at Little Minook to Albin Martin, Rampart, Alaska, who made a small recovery panning bedrock from old workings. Swanson Brothers Mining Co. sold its mine and equipment to William Thomas, former operator of Kobuk Mines.

*Ruby District.*—Miscovich Bros. recovered a substantial quantity of gold from an opencut placer on Poorman Creek. The rest of the gold recovered in the district was extracted from gravel treated in nonfloating washing plants by Northern Lights Mining Co. and Long Creek Mining Co., Long Creek, and Clarence Zaiser, Greenstone Creek. These placer mines used combinations of hydraulic pumps, bulldozers, dragline excavators, and sluiceboxes to recover gold.

*Tolovana District.*—Olive Creek Mines used bulldozers to remove overburden and deliver gravel to sluiceboxes. From May 26 to October 6 the company recovered 1,638 fine ounces of gold from 80,000 cubic yards of gravel washed at its placer mine on Olive Creek. A dragline excavator stacked tailing and helped to remove overburden.

Yukon Placer Mining, Inc., leading gold producer in the Tolovana district, used a nonfloating washing plant to recover 3,022 fine ounces of gold during the mining season. A dragline excavator stacked tailing and removed 200,000 cubic yards of overburden at the Livengood Creek mine. Gold was recovered from 260,000 cubic yards of gravel delivered to a 4- by 60-foot sluicebox by 3 bulldozers. Other placer operations that produced gold in the district were Wilbur Creek Mines (Bentley Falls), Wilbur Creek; John Radak, Livengood Creek; and Mandich, Jurich & Car, Lillian Creek.

465877—58——8

Digitized by Google

Digitized by Google

# The Mineral Industry of Arizona

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker[1]

AN ALLTIME record high value of mineral production of $485.8 million was established in Arizona in 1956. This was 28 percent above the previous record of $378.3 million set in 1955. The gain resulted primarily from an increased value of copper output brought about by the combined factors of a greater tonnage of copper produced and a higher price for copper. Major credit for the increased output goes to the San Manuel Copper Corp., the State's newest large-scale copper producer. As it had since 1910, Arizona continued to lead the United States in copper output; its production was more than double that of the second highest producer, Utah.

The value of the copper output ($430 million) was 89 percent of Arizona's total value of mineral production in 1956. Other metals, mainly gold, silver, lead, zinc, manganese ore and concentrate, molybdenum, and uranium accounted for an additional $35.5 million (6 percent of the total). Uranium ore production was included in the mineral production data for the first time in 1956. Nonmetals, chiefly sand and gravel, stone, lime, and cement, supplied $20.2 million, whereas fuels, coal and natural gas, were valued at $69,000. Increased production was reported for each of these commodities mentioned above. Gypsum output increased by five times as a result of the opening of a new gypsum-products plant. Mercury output was only a fraction of what it was in 1955 primarily because of a drop in price for mercury.

Commodities that were produced in 1955 but not produced in 1956 included columbium (niobium)-tantalum concentrate, mica, barite, and diatomite. Decline in output was reported for clays, asbestos, and feldspar. Output of vanadium, recovered as a byproduct of the treatment of uranium ores from Apache County, was greater in 1956.

Data released by the Atomic Energy Commission (AEC) indicated that, as of November 1, 1956, Arizona had 4 percent of the United States uranium-ore reserves and 3 percent of the milling capacity; for the fiscal year 1956 (July 1, 1955, to and including June 30, 1956), it furnished 10 percent of the national uranium-ore production.

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.



Digitized by Google

**TABLE 1.—Mineral production in Arizona, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Beryllium concentrate—gross weight | (2) | (2) | 6 | $2,614 |
| Clays | 254,443 | $868,664 | [3] 111,737 | [3] 167,600 |
| Coal | 8,898 | 59,286 | 10,060 | 66,019 |
| Copper (recoverable content of ores, etc.) | 454,105 | 338,762,330 | 505,908 | 430,021,800 |
| Gem stones | (4) | 97,000 | (4) | 104,000 |
| Gold (recoverable content of ores, etc.)—troy ounces | 127,616 | 4,466,560 | 146,110 | 5,113,850 |
| Gypsum (crude) | (3) | (3) | 95,666 | 366,115 |
| Lead (recoverable content of ores, etc.) | 9,817 | 2,925,466 | 11,999 | 3,767,686 |
| Lime | 112,028 | 1,437,632 | 126,876 | 1,755,774 |
| Manganese ore and concentrate (35 percent or more Mn)—gross weight | 1,444 | (2) | 42,008 | 3,468,299 |
| Mercury—76-pound flasks | 477 | 138,497 | (2) | (2) |
| Mica (scrap) | 1,353 | 8,742 | ---- | ---- |
| Molybdenum (content of ore and concentrate)—thousand pounds | 1,497 | 1,510,521 | 2,392 | 2,670,457 |
| Natural gas—million cubic feet | (3) | (3) | 21 | 3,000 |
| Perlite | 10,568 | 83,956 | 15,928 | 108,404 |
| Pumice | 92,136 | 372,735 | 114,609 | 366,095 |
| Rare-earth metals concentrates—pounds | ---- | ---- | 150 | 450 |
| Sand and gravel | 7,755,347 | 6,518,905 | 7,932,500 | 6,166,750 |
| Silver (recoverable content of ores, etc.)—troy ounces | 4,634,179 | 4,194,166 | 5,179,185 | 4,687,424 |
| Stone | 1,600,939 | 2,328,566 | 1,623,029 | 2,474,519 |
| Tungsten concentrate—60-percent $WO_3$ basis | 181 | 676,389 | 186 | 636,686 |
| Zinc (recoverable content of ores, etc.) | 22,684 | 5,580,264 | 25,580 | 7,008,920 |
| Value of items that cannot be disclosed: Asbestos, barite (1955), cement, columbium-tantalum concentrate (1955), diatomite (1955), feldspar, vanadium, uranium ore (1956), and values indicated by footnote 2 | ---- | 9,201,394 | ---- | 17,900,579 |
| Total, Arizona [5] | ---- | 378,277,000 | ---- | 485,751,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration purchase depots is excluded. Excludes uranium ore for 1955, data not available.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Excludes bentonite; value included with "Items that cannot be disclosed."
[4] Weight not recorded.
[5] The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.

**TABLE 2.—Average unit value of selected mineral commodities in Arizona, 1955–56 [1]**

| Commodity | 1955 | 1956 | Commodity | 1955 | 1956 |
|---|---|---|---|---|---|
| Clays—short ton | $3.414 | $3.431 | Pumice—short ton | $4.045 | $3.194 |
| Coal—do | 6.663 | 6.563 | Sand and gravel—do | .841 | .777 |
| Copper [2]—pound | .373 | .425 | Silver [3]—troy ounce | .905+ | .905+ |
| Gold [3]—troy ounce | 35.000 | 35.000 | Stone—short ton | 1.455 | 1.525 |
| Lead [2]—pound | .149 | .157 | Tungsten—short ton unit | 62.300 | 57.138 |
| Molybdenum—do | 1.009 | 1.116 | Zinc [2]—pound | .123 | .137 |
| Perlite—short ton | [4] 7.944 | 6.806 | | | |

[1] Average value f. o. b. mines or mills reported by the producers, except as otherwise noted.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Revised figure.
[5] Treasury buying price for newly mined silver, July 1, 1946, to date—$0.9050505.

**New Plants and Construction.**—Several New plants for treating or processing ores and commodities were completed in Arizona in 1956, and construction was begun on others. In the copper industry the 30,000-ton-per-day concentrator and smelter at the San Manuel mine were placed in operation in January.

At Ray the program of expansion of the leaching facilities and construction of the plant for producing sulfuric acid and iron residue

Digitized by Google

from byproduct pyrite for use in the leaching operation was completed; also at Ray a $40-million program for increasing production capacity by 20,000 tons of copper annually by enlargement of the pit and mill and the construction of a smelter was begun. The $6.5 million project of rehabilitation and reequipment of the Inspiration concentrator, in preparation for conversion to the dual metallurgical process, was completed; the 3,000-ton-per-day flotation plant was placed in operation in December.

A new pilot plant for the producing of electrolytic copper with a byproduct of sulfuric acid began production in the spring at Bagdad. The acid will be used to recover copper from oxide copper ore which comprises one-third of the copper reserve at Bagdad that is not recoverable by present milling methods.

At the Silver Bell mine a section to recover the molybdenum content of the copper ore was added to the 7,500-ton-per-day mill. The construction program of the Pima Mining Co. 3,000-ton-per-day flotation plant was carried to completion in 1956 and test runs were made in December.

A 250-ton-per-day mill for treating uranium ore, Arizona's first, was placed in operation in July at Tuba City. A new gypsum-products plant was installed at Phoenix by the Union Gypsum Co.

**Employment and Earnings.**—Detailed data on employment and earnings in Arizona, procured from publications of the United States Department of Labor and Arizona Employment Security Commission, are given in tables 3 and 4. Annual average employment in the mining industry in Arizona composed 6.5 percent of the total nonagricultural employment in 1956 and increased 13 percent over 1955. Average hourly earnings for employees in copper mining rose from $2.35 in January to $2.42 in December 1956 and averaged $2.38 for the year. Average weekly earnings for copper mining was $111.65.

**Injuries.**—The Arizona State mine inspector reported [2] that there were 10 fatal accidents in underground and none in open-pit mines in Arizona for the fiscal year ended November 30, 1956. In addition, 269 serious accidents resulting in loss of 14 days or more occurred in underground mines and 43 in open-pit mines.

**TABLE 3.—Nonagricultural employment, 1955–56** [1]

[United States Department of Labor]

| Industry | Annual average employment | | Percent of total nonagricultural | |
|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 |
| Mining [2] | 13,900 | 15,700 | 6.3 | 6.5 |
| Contract construction [3] | 19,400 | 20,100 | 8.8 | 8.3 |
| Manufacturing | 31,300 | 35,700 | 14.2 | 14.7 |
| Transportation and public utilities | 20,800 | 21,000 | 9.4 | 8.6 |
| Wholesale and retail trade | 55,400 | 59,900 | 25.0 | 24.6 |
| Finance, insurance, and real estate | 8,500 | 9,500 | 3.8 | 3.9 |
| Service and miscellaneous | 27,800 | 30,800 | 12.6 | 12.7 |
| Government | 44,100 | 50,400 | 19.9 | 20.7 |
| Total nonagricultural | 221,200 | 243,100 | 100.0 | 100.0 |

[1] Excludes administrative and nonworking supervisory personnel.
[2] Includes extraction of minerals occurring naturally, quarrying, well operation, milling, exploration and development of mineral properties, and removal of overburden.
[3] Includes some employees engaged in mining and quarrying where work is done by contractors and separate records are not kept.

[2] Massey, Edward (Ed.), State mine inspector, 45th Annual Report of the State Mine Inspector, for Year Ending November 30, 1956: 26 pp.

Digitized by Google

**Defense Minerals Exploration Administration (DMEA) Program.**—During 1956 2 DMEA contracts were executed for a total of $115,568, compared with 5 in 1955 for a total of $269,650. One contract (for $26,788, of which 75 percent was financed by the Government and 25 percent by Big Six Explorations, Inc.) was for the exploration for uranium on the Sorrell Horse and Citation claims in Gila County. A second contract (for a total of $88,780, with equal financial participation by the Government and Lewisohn Copper Corp.) was for a copper-exploration program at the Peach mine in Pima County.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Beryllium.**—Three operations in Arizona in 1956 produced 6 tons of beryllium concentrate (beryl) valued at $2,614, all sold to Beryl Ores Co., Arvada, Colo. The beryl was recovered from pegmatite by hand sorting. The Federal Bureau of Mines conducted research at experiment stations at Rapid City, S. Dak., and University, Ala., to improve the processes to recover beryl from pegmatite and to extract beryllium from concentrate. The Government purchase program for beryl, administered by the General Services Administration (GSA), was extended to June 30, 1962, or to when deliveries total 4,500 short tons, whichever occurs first.

**Copper.**—Arizona continued to rank first in the United States in copper output—a position it has held since 1910. In 1956 the lead over Utah, the second-ranking copper producer, was increased to 102 percent from 95 percent in 1955. An alltime record production of 505,900 short tons of copper valued at $430 million was established in Arizona in 1956. Compared with 1955, this represented an 11-percent increase in quantity and a 27-percent increase in value. Nine-tenths of the total value of the mineral production in the State in 1956 was supplied by copper.

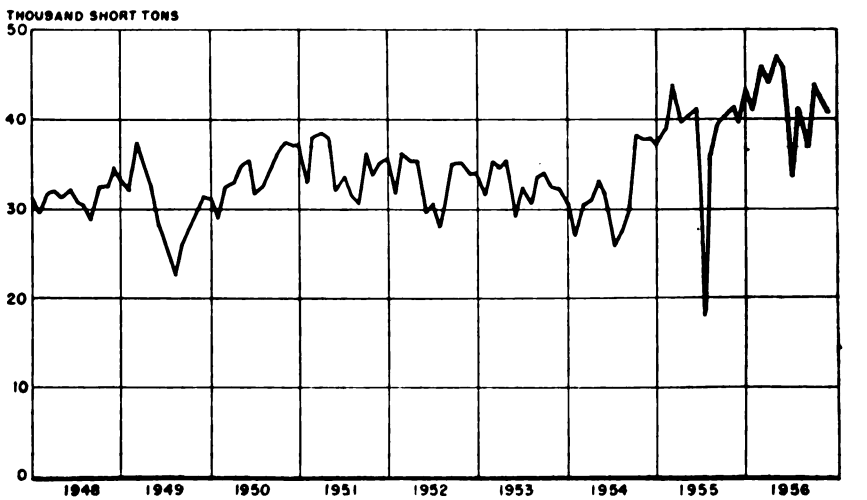



FIGURE 1.—Mine production of copper in Arizona, 1948–56, by months, in terms of recoverable metal.

Digitized by Google

The 15 leading copper-producing mines in Arizona in 1956 contributed 99 percent of the total copper output in the State; the first 5 mines supplied 71 percent. The Morenci Branch of the Phelps Dodge Corp. continued to be Arizona's largest copper producer. Output from this source was three-quarters larger than the next highest producer, Copper Queen Branch of the Phelps Dodge Corp. The Copper Queen Branch showed a 24-percent gain in production, partly as a result of advanced output from the Copper Queen underground mine but mostly as a result of a major increase in output from the Lavender open-pit mine. Ray Mines Division of Kennecott Copper Corp. reported a 9-percent increase in copper output in 1956, compared with 1955.

Part of Arizona's increased copper output in 1956 resulted from gains from several of the principal copper producers, including Morenci, Copper Queen, Lavender, Ray, and Copper Cities. However, the major credit for the overall increase in copper output for the State goes to Arizona's newest large-scale producer—San Manuel mine operated by the San Manuel Copper Corp., a Magma Copper Co. wholly owned subsidiary.

**TABLE 4.—15 leading copper-producing mines in Arizona in 1956, in order of output**

| Rank in 1956 | Rank in 1955 | Mine | District | County | Operator | Source of copper in 1956 |
|---|---|---|---|---|---|---|
| 1 | 1 | Morenci | Copper Mountain. | Greenlee | Phelps Dodge Corp. | Copper ore. |
| 2 | 3 | Copper Queen-Lavender pit. | Warren | Cochise | do | Do. |
| 3 | 2 | New Cornelia | Ajo | Pima | do | Do. |
| 4 | 4 | Ray pit | Mineral Creek. | Pinal | Kennecott Copper Corp. | Do. |
| 5 | (1) | San Manuel | Old Hat | do | San Manuel Copper Corp. | Do. |
| 6 | 5 | Inspiration | Globe-Miami | Gila | Inspiration Consolidated Copper Co. | Do. |
| 7 | 6 | Copper Cities | do | do | Copper Cities Mining Co. | Do. |
| 8 | 7 | Magma | Pioneer | Pinal | Magma Copper Co. | Do. |
| 9 | 8 | Silver Bell Unit. | Silver Bell | Pima | American Smelting and Refining Co. | Do. |
| 10 | 9 | Miami | Globe-Miami | Gila | Miami Copper Co. | Do. |
| 11 | 10 | Bagdad | Eureka | Yavapai | Bagdad Copper Corp. | Do. |
| 12 | 11 | Mineral Hill, etc. | Pima | Pima | Banner Mining Co. | Do. |
| 13 | 13 | Castle Dome dump. | Globe-Miami | Gila | Castle Dome Copper Co., Inc. | Copper precipitates. |
| 14 | 12 | Johnson Camp Unit-Moore shaft. | Cochise | Cochise | Coranado Copper & Zinc Co. | Copper, copper-zinc ores. |
| 15 | 14 | United Verde | Verde | Yavapai | Big Hole Mining Co.<br>Leach Copper Co.<br>Milo E. Stoney. | Copper, copper precipitates, copper-smelter cleanings. |

[1] Did not produce in 1955.

Digitized by Google

**TABLE 5.—Ore mined, waste and leach material removed, and total copper production at principal copper open-pit and underground mines in Arizona, 1955–56** [1]

| Mine | Ore mined (short tons) | | Waste and leach material removed (short tons) | | Total copper produced from all sources [2] (short tons) | |
|---|---|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 | 1955 | 1956 |
| Open pit: | | | | | | |
| Morenci | 15,899,410 | 16,794,287 | 33,148,792 | 37,788,263 | 124,413 | 127,156 |
| New Cornelia | 10,274,836 | 10,112,434 | 14,663,772 | 14,504,201 | 70,222 | 66,432 |
| Lavender | 4,433,218 | 5,069,049 | 8,013,961 | 6,544,497 | 29,931 | 40,153 |
| Ray | 4,818,358 | 5,852,742 | [3] 10,204,329 | (4) | 48,983 | 53,248 |
| Inspiration | 3,731,027 | 3,709,789 | 11,517,613 | 11,456,577 | 38,114 | 37,083 |
| Copper Cities | 4,004,052 | 4,167,147 | 3,347,720 | 3,869,132 | 27,549 | 27,826 |
| Bagdad | 1,352,230 | 1,363,505 | [3] 9,175,745 | 12,765,358 | 10,892 | 6,734 |
| Castle Dome dump | | | | | [5] 1,115 | [5] 2,617 |
| Pima | | | [3] [6] 624,000 | [3] [6] 8,849,000 | | |
| Underground: | | | | | | |
| San Manuel | | 5,539,581 | | | | 39,076 |
| Copper Queen | 546,001 | 632,088 | | | 28,213 | 31,927 |
| Magma | 458,488 | 453,683 | | | 23,945 | 23,685 |
| Miami | 3,721,675 | 3,812,165 | | | 19,495 | 19,282 |

[1] Source: Company annual reports.
[2] Includes copper recovered from leaching of material in place or on dumps.
[3] Source: Mining World Catalog, Survey and Directory Number, Apr. 15, 1957, p. 94.
[4] Data not available.
[5] Recovered from water leaching of mine dumps only.
[6] Cubic yards.

**TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Arizona, 1947–51 (average), 1952–56, and total, 1860–1956, in terms of recoverable metals** [1]

| Year | Mines producing | | Material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 318 | 29 | 40,692,894 | 109,749 | $3,841,222 | 4,964,797 | $4,493,346 |
| 1952 | 187 | 7 | 45,385,327 | 112,355 | 3,932,425 | 4,701,330 | 4,254,941 |
| 1953 | 163 | 6 | 45,700,618 | 112,824 | 3,948,840 | 4,351,429 | 3,938,263 |
| 1954 | 164 | 5 | 43,460,477 | 114,809 | 4,018,315 | 4,298,811 | 3,890,641 |
| 1955 | 173 | 7 | 52,710,060 | 127,616 | 4,466,560 | 4,634,179 | 4,194,166 |
| 1956 | 194 | 5 | 61,044,282 | 146,110 | 5,113,850 | 5,179,185 | 4,687,424 |
| 1860–1956 | | | [3] | 12,030,619 | 308,566,820 | 340,676,334 | 260,696,864 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 383,904 | $165,423,662 | 27,162 | $8,536,014 | 58,652 | $16,341,227 | $198,635,471 |
| 1952 | 395,719 | 191,527,996 | 16,520 | 5,319,440 | 47,143 | 15,651,476 | 220,686,278 |
| 1953 | 393,525 | 225,883,350 | 9,428 | 2,470,136 | 27,530 | 6,331,900 | 242,572,489 |
| 1954 | 377,927 | 222,976,930 | 8,385 | 2,207,490 | 21,461 | 4,635,576 | 237,818,952 |
| 1955 | 454,105 | 338,762,330 | 9,817 | 2,925,466 | 22,684 | 5,580,264 | 355,928,786 |
| 1956 | 505,908 | 430,021,800 | 11,999 | 3,767,686 | 25,580 | 7,008,920 | 450,599,680 |
| 1860–1956 | 15,224,796 | 5,545,567,518 | 566,016 | 107,821,422 | 715,127 | 174,288,193 | 6,396,940,817 |

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-retreated, and ore, old tailings, or copper precipitates shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed or tonnage of precipitates shipped.
[3] Figure not available.

Digitized by Google

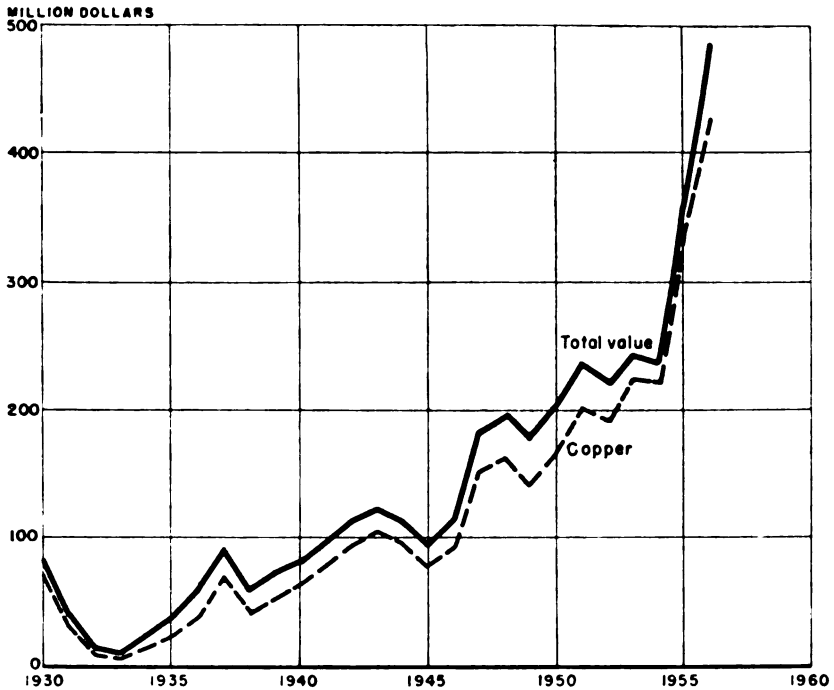



FIGURE 2.—Value of mine production of copper and total value of mineral production in Arizona, 1930–56.

**TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 12,040 | 464,237 | 43,411 | 959 | 1,822 |
| February | 13,027 | 459,765 | 41,054 | 1,004 | 2,094 |
| March | 13,478 | 499,712 | 45,679 | 1,125 | 2,293 |
| April | 12,274 | 457,495 | 44,079 | 1,005 | 2,154 |
| May | 13,377 | 477,741 | 46,981 | 967 | 2,194 |
| June | 12,733 | 445,270 | 45,544 | 1,009 | 2,204 |
| July | 9,751 | 328,760 | 33,526 | 851 | 1,943 |
| August | 11,834 | 410,118 | 41,141 | 1,000 | 2,088 |
| September | 12,020 | 377,875 | 37,742 | 976 | 2,073 |
| October | 12,285 | 422,532 | 43,561 | 1,089 | 2,271 |
| November | 11,681 | 418,495 | 42,472 | 965 | 2,074 |
| December | 11,610 | 417,185 | 40,708 | 1,049 | 2,370 |
| Total | 146,110 | 5,179,185 | 505,908 | 11,999 | 25,580 |

Digitized by Google

TABLE 8.—Gold and silver produced at placer mines, 1947–51 (average) and 1952–56, in fine ounces, in terms of recoverable metals

| Year | Small-scale hand methods [1] | | Gravel mechanically handled | | | | Underground placers | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Nonfloating washing plants [2] | | Bucketline and dragline dredges | | Drift | | | |
| | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver |
| 1947–51 (average) | 139 | 7 | 247 | 39 | -- | -- | 18 | (3) | 403 | 46 |
| 1952 | 11 | -- | 58 | 10 | -- | -- | 1 | -- | 70 | 10 |
| 1953 | 60 | -- | -- | -- | 49 | 7 | -- | -- | 109 | 7 |
| 1954 | 78 | 6 | -- | -- | -- | -- | -- | -- | 78 | 6 |
| 1955 | 79 | 5 | 4 | -- | -- | -- | -- | -- | 83 | 5 |
| 1956 | 92 | 8 | 2 | -- | -- | -- | -- | -- | 94 | 8 |

[1] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
[2] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[3] Less than 1.

Digitized by Google

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals**

| County and district | Mines producing [1] (lode and placer) | Lode material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Fine ounces | Value | Fine ounces | Value | Pounds | Value | Pounds | Value | Pounds | Value | |
| Apache County | 1 | 5 | | | | | 300 | $128 | | | | | $128 |
| Cochise County: | | | | | | | | | | | | | |
| Cochise (Dragoon) | 1 | 76,668 | | | 31,147 | $28,190 | 3,337,400 | 1,418,395 | | | 5,590,200 | $765,857 | 2,212,442 |
| Golden Rule | 1 | 45 | | | 41 | 37 | 100 | 43 | 10,300 | $1,617 | 1,700 | 233 | 1,930 |
| Smelter and Turquoise [3] | 4 | 16,156 | 954 | $33,390 | 24,615 | 22,278 | 1,356,000 | 576,300 | 303,700 | 47,681 | | | 679,649 |
| Swisshelm | 1 | 43 | 4 | 140 | 147 | 133 | | | 4,700 | 738 | | | 1,011 |
| Tombstone | 1 | 15 | | | 9 | 8 | 200 | 85 | 2,400 | 377 | | | 470 |
| Warren (Bisbee) | 2 | 5,701,075 | 45,088 | 1,578,080 | 1,267,315 | 1,146,984 | 144,160,200 | 61,268,085 | | | | | 63,993,149 |
| Whetstone (Benson) | 1 | 731 | 3 | 105 | 343 | 310 | 19,500 | 8,287 | | | | | 8,702 |
| Total | 11 | 5,794,733 | 46,049 | 1,611,715 | 1,323,617 | 1,197,940 | 148,873,400 | 63,271,195 | 321,100 | 50,413 | 5,591,900 | 766,090 | 66,897,353 |
| Coconino County: | | | | | | | | | | | | | |
| Francis | 1 | 879 | | | | | 63,800 | 27,115 | | | | | 27,115 |
| Grand Canyon | 1 | 449 | | | 4 | 4 | 20,600 | 8,755 | | | | | 8,759 |
| Hualpai Indian Reservation | 2 | 804 | | | 196 | 177 | 74,400 | 31,620 | | | | | 31,797 |
| Jacob Canyon and Warm Springs | 1 | 1,855 | | | 204 | 185 | 175,000 | 74,375 | | | | | 74,560 |
| White Mesa | 1 | 365 | | | 270 | 244 | 28,100 | 11,943 | | | | | 12,187 |
| Total | 6 | 4,352 | | | 674 | 610 | 361,900 | 153,808 | | | | | 154,418 |
| Gila County: | | | | | | | | | | | | | |
| Banner (Christmas) | 2 | 9,034 | 3 | 105 | 293 | 265 | 241,400 | 102,595 | | | | | 102,965 |
| Globe-Miami | 10 | 11,712,273 | 1,517 | 53,095 | 128,785 | 116,557 | 173,893,400 | 73,904,695 | | | | | 74,074,347 |
| Green Valley | 1 | 202 | 1 | 35 | 42 | 38 | 10,300 | 4,378 | | | | | 4,451 |
| Pioneer (Superior) [4] | 1 | 32 | | | 37 | 33 | 4,000 | 1,700 | | | | | 1,733 |
| Sierra Ancha | 1 | 1 | 6 | 210 | 2 | 2 | | | | | | | 212 |
| Total | 15 | 11,721,542 | 1,527 | 53,445 | 129,159 | 116,895 | 174,149,100 | 74,013,368 | | | | | 74,183,708 |

See footnotes at end of table.

Digitized by Google

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals—Continued**

| County and district | Mines producing [1] (lode and placer) | Lode material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Fine ounces | Value | Fine ounces | Value | Pounds | Value | Pounds | Value | Pounds | Value | |
| Graham County: | | | | | | | | | | | | | |
| Aravaipa | 1 | 18,449 | | | 11,118 | $10,062 | 125,900 | $53,507 | 832,000 | $130,624 | 2,370,500 | $324,759 | $518,952 |
| Clark | 1 | 4 | | | 10 | 9 | 200 | 85 | | | | | 94 |
| Lone Star | 2 | 98 | 3 | $105 | 35 | 32 | 3,700 | 1,573 | | | | | 1,710 |
| Stanley Butte | 2 | 23 | | | 14 | 13 | 2,800 | 1,190 | | | | | 1,203 |
| Total | 6 | 18,574 | 3 | 105 | 11,177 | 10,116 | 132,600 | 56,355 | 832,000 | 130,624 | 2,370,500 | 324,759 | 521,959 |
| Greenlee County: | | | | | | | | | | | | | |
| Copper Mountain (Morenci) | 2 | 16,799,770 | 9,527 | 333,445 | 800,468 | 724,464 | 254,699,800 | 108,247,415 | | | | | 109,305,324 |
| Maricopa County: | | | | | | | | | | | | | |
| Agua Fria | 3 | 105 | 4 | 140 | 34 | 31 | 8,200 | 3,485 | | | | | 3,656 |
| Cave Creek & Camp Creek | 3 | 125 | 1 | 35 | 72 | 65 | 3,100 | 1,317 | | | | | 1,417 |
| Ellsworth [8] | 1 | 13 | 2 | 70 | 3 | 3 | 900 | 383 | | | | | 456 |
| New River | 1 | 24 | | | 7 | 6 | 5,100 | 2,167 | | | | | 2,173 |
| Vulture | 2 | 41 | | | 21 | 19 | 1,200 | 510 | | | | | 529 |
| Wickenburg [7] | 1 | | 2 | 70 | | | | | | | | | 70 |
| Total | 11 | 308 | 9 | 315 | 137 | 124 | 18,500 | 7,862 | | | | | 8,301 |
| Mohave County: | | | | | | | | | | | | | |
| Cedar Valley | 2 | 800 | 1 | 35 | 680 | 615 | 34,800 | 14,790 | 4,000 | 628 | | | 16,068 |
| Lost Basin [7] | 1 | | 6 | 210 | 1 | 1 | | | | | | | 211 |
| Minnesota | 1 | 259 | 4 | 140 | 240 | 217 | 14,100 | 5,992 | | | | | 6,349 |
| Owens | 4 | 618 | 37 | 1,295 | 151 | 137 | 17,600 | 7,480 | | | 100 | 14 | 8,926 |
| Wallapai (Chloride, Cerbat, Stockton Hill) | 4 | 2,499 | 11 | 385 | 1,020 | 923 | 212,800 | 90,440 | 27,400 | 4,302 | 55,800 | 7,644 | 103,694 |
| Total | 12 | 4,176 | 59 | 2,065 | 2,092 | 1,893 | 279,300 | 118,702 | 31,400 | 4,930 | 55,900 | 7,658 | 135,248 |
| Pima County: | | | | | | | | | | | | | |
| Ajo | 1 | 10,115,754 | 39,040 | 1,366,400 | 508,483 | 466,203 | 132,863,800 | 56,467,115 | | | | | 58,293,718 |
| Amole and Helvetia (Rosemont) [3] | 6 | 6,223 | 1 | 35 | 3,453 | 3,125 | 394,100 | 167,493 | 1,000 | 157 | 1,400 | 192 | 171,002 |

Digitized by Google

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arivaca | 1 | 37 | | | 51 | 46 | | | 700 | 110 | | | 156 |
| Baboquivari | 1 | 1,898 | 26 | 910 | 3,065 | 2,774 | 34,800 | 14,790 | | | | | 18,474 |
| Bronnel | 1 | 586 | 3 | 105 | 2,496 | 2,259 | 11,600 | 4,930 | | | | | 7,294 |
| Cerro Colorado | 1 | 37 | 1 | 35 | 743 | 672 | 200 | 85 | | | | | 792 |
| Fresnal | 1 | 3,324 | 381 | 13,335 | 5,436 | 4,920 | | | | | | | 18,255 |
| Meyer (Gunsight) | 1 | 13 | 6 | 210 | 2 | 2 | | | | | | | 212 |
| Old Hat [6] | 3 | 171 | 1 | 35 | 255 | 231 | 9,400 | 3,995 | 8,800 | 1,382 | 2,700 | 370 | 6,013 |
| Pima (Sierritas, Papago, Twin Buttes) | 9 | 223,428 | 8 | 280 | 225,567 | 204,150 | 9,679,800 | 4,113,915 | 3,620,700 | 568,450 | 5,571,700 | 763,323 | 5,650,118 |
| Quijotoa [7] | 2 | 733 | 7 | 245 | 846 | 766 | 27,600 | 11,730 | | | | | 12,741 |
| Silver Bell | 6 | 2,755,570 | 372 | 13,020 | 171,909 | 155,586 | 39,949,300 | 16,978,452 | 13,800 | 2,166 | 656,300 | 89,913 | 17,239,137 |
| Total | 33 | 13,107,774 | 39,846 | 1,394,610 | 922,306 | 834,734 | 182,970,600 | 77,762,505 | 3,645,000 | 572,265 | 6,232,100 | 853,798 | 81,417,912 |
| **Pinal County:** | | | | | | | | | | | | | |
| Bunker Hill (Copper Creek) | 1 | 50 | | | 25 | 23 | 3,400 | 1,445 | | | | | 1,468 |
| Casa Grande | 2 | 546 | 8 | 280 | 545 | 493 | 39,600 | 16,830 | 12,200 | 1,915 | | | 19,518 |
| Crozier Peak | 1 | 25 | | | 143 | 129 | 2,300 | 978 | | | | | 1,107 |
| Mineral Creek (Ray) | 6 | 5,879,050 | 1,632 | 57,120 | 261,426 | 236,604 | 107,036,400 | 45,490,470 | 212,500 | 33,363 | | | 45,817,557 |
| Mineral Hill | 4 | 157 | 16 | 560 | 91 | 82 | 2,500 | 1,063 | 13,100 | 2,057 | | | 3,762 |
| Old Hat (Oracle, Mammoth) [6] | 2 | 5,539,617 | 9,719 | 340,165 | 136,090 | 123,168 | 78,156,100 | 33,216,342 | | | | | 33,679,675 |
| Owl Head | 3 | 90 | 1 | 35 | 15 | 14 | 3,200 | 1,360 | | | | | 1,409 |
| Picacho | 2 | 77 | | | 19 | 17 | 6,000 | 2,550 | | | | | 2,567 |
| Pioneer (Superior) [4] | 3 | 453,876 | 11,648 | 407,680 | 491,498 | 444,831 | 47,777,000 | 20,305,225 | | | | | 21,157,736 |
| Pipsey | 1 | 25 | 2 | 70 | 26 | 24 | 2,100 | 892 | | | | | 986 |
| Riverside | 2 | 182 | | | 164 | 148 | 5,300 | 2,252 | | | | | 2,400 |
| Total | 27 | 11,873,695 | 23,026 | 805,910 | 890,042 | 805,533 | 233,033,900 | 99,039,407 | 237,800 | 37,335 | | | 100,688,185 |
| **Santa Cruz County:** | | | | | | | | | | | | | |
| Harshaw and Tyndall [3] | 7 | 55,448 | 153 | 5,355 | 172,869 | 156,455 | 239,000 | 101,575 | 6,652,000 | 1,044,364 | 7,949,200 | 1,089,040 | 2,396,789 |
| Oro Blanco (Ruby) | 1 | 35 | 1 | 35 | 463 | 419 | 1,700 | 723 | 1,200 | 188 | | | 1,365 |
| Palmetto | 1 | 413 | | | | | 29,100 | 12,367 | 1,000 | 157 | 1,200 | 164 | 12,688 |
| Patagonia (Duquesne) | 12 | 10,402 | 6 | 210 | 57,867 | 52,373 | 497,500 | 211,437 | 652,100 | 102,380 | 1,085,500 | 148,714 | 515,114 |
| Red Rock | 1 | 330 | | | 220 | 199 | 3,700 | 1,573 | | | | | 1,772 |
| Total | 22 | 66,628 | 160 | 5,600 | 231,419 | 209,446 | 771,000 | 327,675 | 7,306,300 | 1,147,089 | 9,035,900 | 1,237,918 | 2,927,728 |
| **Yavapai County:** | | | | | | | | | | | | | |
| Agua Fria | 6 | 639 | 31 | 1,085 | 448 | 405 | 77,800 | 33,065 | | | | | 34,555 |
| Big Bug | 2 | 253,971 | 25,327 | 886,445 | 799,858 | 723,912 | 484,800 | 206,040 | 11,552,400 | 1,813,727 | 27,867,100 | 3,817,792 | 7,447,916 |
| Black Hills | 1 | 168 | 2 | 70 | 54 | 49 | 6,700 | 2,848 | | | | | 2,967 |
| Bullard or Pierce | 1 | 34 | 4 | 140 | 14 | 13 | 2,000 | 850 | | | | | 1,003 |
| Castle Creek | 1 | 38 | 2 | 70 | 16 | 14 | 8,300 | 3,528 | | | | | 3,612 |
| Copper Basin | 1 | 14,774 | | | | | 703,200 | 298,860 | | | | | 298,860 |
| Copper Creek | 1 | 271 | 3 | 105 | 193 | 175 | 17,600 | 7,480 | | | | | 7,760 |
| Eureka (Bagdad) | 3 | 1,363,882 | 13 | 455 | 53,167 | 48,119 | 13,504,700 | 5,739,497 | | | 6,100 | 836 | 5,788,907 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals—Continued**

| County and district | Mines producing [1] (lode and placer) | Lode material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Fine ounces | Value | Fine ounces | Value | Pounds | Value | Pounds | Value | Pounds | Value | |
| Graham County: | | | | | | | | | | | | | |
| Aravaipa | 1 | 18,449 | | | 11,118 | $10,062 | 125,900 | $53,507 | 832,000 | $130,624 | 2,370,500 | $324,759 | $518,952 |
| Clark | 1 | 4 | | | 10 | 9 | 200 | 85 | | | | | 94 |
| Lone Star | 2 | 98 | 3 | $105 | 35 | 32 | 3,700 | 1,573 | | | | | 1,710 |
| Stanley Butte | 2 | 23 | | | 14 | 13 | 2,800 | 1,190 | | | | | 1,203 |
| Total | 6 | 18,574 | 3 | 105 | 11,177 | 10,116 | 132,600 | 56,355 | 832,000 | 130,624 | 2,370,500 | 324,759 | 521,959 |
| Greenlee County: | | | | | | | | | | | | | |
| Copper Mountain (Morenci) | 2 | 16,799,770 | 9,527 | 333,445 | 800,468 | 724,464 | 254,699,800 | 108,247,415 | | | | | 109,305,324 |
| Maricopa County: | | | | | | | | | | | | | |
| Agua Fria | 3 | 105 | 4 | 140 | 34 | 31 | 8,200 | 3,485 | | | | | 3,656 |
| Cave Creek & Camp Creek | 3 | 125 | 1 | 35 | 72 | 65 | 3,100 | 1,317 | | | | | 1,417 |
| Ellsworth [4] | 1 | 13 | 2 | 70 | 3 | 3 | 900 | 383 | | | | | 456 |
| New River | 1 | 24 | | | 7 | 6 | 5,100 | 2,167 | | | | | 2,173 |
| Vulture | 2 | 41 | | | 21 | 19 | 1,200 | 510 | | | | | 529 |
| Wickenburg [5] | 1 | | 2 | 70 | | | | | | | | | 70 |
| Total | 11 | 308 | 9 | 315 | 137 | 124 | 18,500 | 7,862 | | | | | 8,301 |
| Mohave County: | | | | | | | | | | | | | |
| Cedar Valley | 2 | 800 | 1 | 35 | 680 | 615 | 34,800 | 14,790 | 4,000 | 628 | | | 16,068 |
| Lost Basin [7] | 1 | | 6 | 210 | 1 | 1 | | | | | | | 211 |
| Minnesota | 1 | 259 | 4 | 140 | 240 | 217 | 14,100 | 5,992 | | | | | 6,349 |
| Owens | 4 | 618 | 37 | 1,295 | 151 | 137 | 17,600 | 7,480 | | | 100 | 14 | 8,926 |
| Wallapai (Chloride, Cerbat, Stockton Hill) | 4 | 2,499 | 11 | 385 | 1,020 | 923 | 212,800 | 90,440 | 27,400 | 4,302 | 55,800 | 7,644 | 103,694 |
| Total | 12 | 4,176 | 59 | 2,065 | 2,092 | 1,893 | 279,300 | 118,702 | 31,400 | 4,930 | 55,900 | 7,658 | 135,248 |
| Pima County: | | | | | | | | | | | | | |
| Ajo | 1 | 10,115,754 | 39,040 | 1,366,400 | 508,483 | 460,203 | 132,863,800 | 56,467,115 | | | | | 58,293,718 |
| Amole and Helvetia (Rosemont) [3] | 6 | 6,223 | 1 | 35 | 3,453 | 3,125 | 394,100 | 167,493 | 1,000 | 157 | 1,400 | 192 | 171,002 |

Digitized by Google

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arivaca | 1 | 37 | | | 51 | 46 | | | 700 | 110 | | | 156 |
| Baboquivari | 1 | 1,898 | 26 | 910 | 3,065 | 2,774 | 34,800 | 14,790 | | | | | 18,474 |
| Bronnel | 1 | 586 | 3 | 105 | 2,496 | 2,259 | 11,600 | 4,930 | | | | | 7,294 |
| Cerro Colorado | 1 | 37 | 1 | 35 | 743 | 672 | 200 | 85 | | | | | 792 |
| Fresnal | 1 | 3,324 | 381 | 13,335 | 5,436 | 4,920 | | | | | | | 18,255 |
| Meyer (Gunsight) | 1 | 13 | 6 | 210 | 2 | 2 | | | | | | | 212 |
| Old Hat [6] | 3 | 171 | 1 | 35 | 255 | 231 | 9,400 | 3,995 | 8,800 | 1,382 | 2,700 | 370 | 6,013 |
| Pima (Sierritas, Papago, Twin Buttes) | 9 | 223,428 | 8 | 280 | 225,567 | 204,150 | 9,679,800 | 4,113,915 | 3,620,700 | 568,450 | 5,571,700 | 763,323 | 5,650,118 |
| Quijotoa [7] | 2 | 733 | 7 | 245 | 846 | 766 | 27,600 | 11,730 | | | | | 12,741 |
| Silver Bell | 6 | 2,755,570 | 372 | 13,020 | 171,909 | 155,586 | 39,949,300 | 16,978,452 | 13,800 | 2,166 | 656,300 | 89,913 | 17,239,137 |
| Total | 33 | 13,107,774 | 39,846 | 1,394,610 | 922,306 | 834,734 | 182,970,600 | 77,762,505 | 3,645,000 | 572,265 | 6,232,100 | 853,798 | 81,417,912 |
| **Pinal County:** | | | | | | | | | | | | | |
| Bunker Hill (Copper Creek) | 1 | 50 | | | 25 | 23 | 3,400 | 1,445 | | | | | 1,468 |
| Casa Grande | 2 | 546 | 8 | 280 | 545 | 493 | 39,600 | 16,830 | 12,200 | 1,915 | | | 19,518 |
| Crozier Peak | 1 | 25 | | | 143 | 129 | 2,300 | 978 | | | | | 1,107 |
| Mineral Creek (Ray) | 6 | 5,879,050 | 1,632 | 57,120 | 261,426 | 236,604 | 107,036,400 | 45,490,470 | 212,500 | 33,363 | | | 45,817,557 |
| Mineral Hill | 4 | 157 | 16 | 560 | 91 | 82 | 2,500 | 1,063 | 13,100 | 2,057 | | | 3,762 |
| Old Hat (Oracle, Mammoth) [6] | 2 | 5,539,617 | 9,719 | 340,165 | 136,090 | 123,168 | 78,156,100 | 33,216,342 | | | | | 33,679,675 |
| Owl Head | 3 | 90 | 1 | 35 | 15 | 14 | 3,200 | 1,360 | | | | | 1,409 |
| Picacho | 2 | 77 | | | 19 | 17 | 6,000 | 2,550 | | | | | 2,567 |
| Pioneer (Superior) [4] | 3 | 453,876 | 11,648 | 407,680 | 491,498 | 444,831 | 47,777,000 | 20,305,225 | | | | | 21,157,736 |
| Pipsey | 1 | 25 | 2 | 70 | 26 | 24 | 2,100 | 892 | | | | | 986 |
| Riverside | 2 | 182 | | | 164 | 148 | 5,300 | 2,252 | | | | | 2,400 |
| Total | 27 | 11,873,695 | 23,026 | 805,910 | 890,042 | 805,533 | 233,033,900 | 99,039,407 | 237,800 | 37,335 | | | 100,688,185 |
| **Santa Cruz County:** | | | | | | | | | | | | | |
| Harshaw and Tyndall [3] | 7 | 55,448 | 153 | 5,355 | 172,869 | 156,455 | 239,000 | 101,575 | 6,652,000 | 1,044,364 | 7,949,200 | 1,089,040 | 2,396,789 |
| Oro Blanco (Ruby) | 1 | 35 | 1 | 35 | 463 | 419 | 1,700 | 723 | 1,200 | 188 | | | 1,365 |
| Palmetto | 1 | 413 | | | | | 29,100 | 12,367 | 1,000 | 157 | 1,200 | 164 | 12,688 |
| Patagonia (Duquesne) | 12 | 10,402 | 6 | 210 | 57,867 | 52,373 | 497,500 | 211,437 | 652,100 | 102,380 | 1,085,500 | 148,714 | 515,114 |
| Red Rock | 1 | 330 | | | 220 | 199 | 3,700 | 1,573 | | | | | 1,772 |
| Total | 22 | 66,628 | 160 | 5,600 | 231,419 | 209,446 | 771,000 | 327,675 | 7,306,300 | 1,147,089 | 9,035,900 | 1,237,918 | 2,927,728 |
| **Yavapai County:** | | | | | | | | | | | | | |
| Agua Fria | 6 | 639 | 31 | 1,085 | 448 | 405 | 77,800 | 33,065 | | | | | 34,555 |
| Big Bug | 2 | 253,971 | 25,327 | 886,445 | 799,858 | 723,912 | 484,800 | 206,040 | 11,552,400 | 1,813,727 | 27,867,100 | 3,817,792 | 7,447,916 |
| Black Hills | 1 | 168 | 2 | 70 | 54 | 49 | 6,700 | 2,848 | | | | | 2,967 |
| Bullard or Pierce | 1 | 34 | 4 | 140 | 14 | 13 | 2,000 | 850 | | | | | 1,003 |
| Castle Creek | 1 | 38 | 2 | 70 | 16 | 14 | 8,300 | 3,528 | | | | | 3,612 |
| Copper Basin | 1 | 14,774 | | | | | 703,200 | 298,860 | | | | | 298,860 |
| Copper Creek | 1 | 271 | 3 | 105 | 193 | 175 | 17,600 | 7,480 | | | | | 7,760 |
| Eureka (Bagdad) | 3 | 1,363,882 | 13 | 455 | 53,167 | 48,119 | 13,504,700 | 5,739,497 | | | 6,100 | 836 | 5,788,907 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals—Continued**

| County and district | Mines producing [1] (lode and placer) | Lode material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Fine ounces | Value | Fine ounces | Value | Pounds | Value | Pounds | Value | Pounds | Value | |
| Yavapai County—Con. | | | | | | | | | | | | | |
| Hassayampa (Prescott, Groom Creek)[3] | 4 | 49 | 8 | $280 | 65 | $59 | 1,600 | $680 | 700 | $110 | | | $1,129 |
| Kirkland | 1 | 5 | 2 | 70 | | | | | | | | | 70 |
| Tiger and Tip Top [3] | 3 | 167 | 13 | 455 | 1,180 | 1,068 | 14,700 | 6,247 | 100 | 15 | | | 7,785 |
| Verde (Jerome) and Walnut Grove [3] | 3 | 15,432 | 89 | 3,115 | 11,648 | 10,542 | 1,536,600 | 653,055 | 14,600 | 2,292 | 400 | $55 | 669,059 |
| Weaver | 1 | 302 | 195 | 6,825 | 108 | 98 | | | | | | | 6,923 |
| White Picacho | 2 | 113 | 6 | 210 | 155 | 140 | 6,200 | 2,635 | | | | | 2,985 |
| Total | 30 | 1,649,845 | 25,695 | 899,325 | 866,906 | 784,594 | 16,364,200 | 6,954,785 | 11,567,800 | 1,816,144 | 27,873,600 | 3,818,683 | 14,273,531 |
| Yuma County: | | | | | | | | | | | | | |
| Castle Dome | 1 | 300 | | | 526 | 476 | | | 56,600 | 8,886 | 100 | 14 | 9,376 |
| Cienega | 4 | 162 | 30 | 1,050 | 40 | 36 | 10,700 | 4,547 | | | | | 5,633 |
| Ellsworth [4] | 7 | 315 | 61 | 2,135 | 314 | 284 | 10,200 | 4,335 | | | | | 6,754 |
| Harcuvar | 3 | 173 | 30 | 1,050 | 23 | 21 | 7,100 | 3,018 | | | | | 4,089 |
| La Paz | 1 | 105 | | | 30 | 27 | 3,200 | 1,360 | | | | | 1,387 |
| Plomosa | 1 | 58 | 2 | 70 | 8 | 7 | 2,400 | 1,020 | | | | | 1,097 |
| Santa Maria | 4 | 1,730 | 7 | 245 | 47 | 43 | 124,900 | 53,082 | | | | | 53,370 |
| Thumb Butte | 1 | 37 | 1 | 35 | 194 | 176 | 2,900 | 1,233 | | | | | 1,444 |
| Trigo [5] | 1 | | 78 | 2,730 | 6 | 5 | | | | | | | 2,735 |
| Total | 23 | 2,880 | 209 | 7,315 | 1,188 | 1,075 | 161,400 | 68,595 | 56,600 | 8,886 | 100 | 14 | 85,885 |
| Grand total: 1956 | 199 | 61,044,282 | 146,110 | 5,113,850 | 5,179,185 | 4,687,424 | 1,011,816,000 | 430,021,800 | 23,998,000 | 3,767,686 | 51,160,000 | 7,008,920 | 450,599,680 |
| 1955 | 180 | 52,710,060 | 127,616 | 4,466,560 | 4,634,179 | 4,194,166 | 908,210,000 | 338,762,330 | 19,634,000 | 2,925,466 | 45,368,000 | 5,580,264 | 355,928,786 |

[1] All lode mines except for 5 placer mines as indicated in footnote reference 7. Operations at miscellaneous cleanups not counted as a producing mine.
[2] Does not include precipitates shipped.
[3] Combined to avoid disclosing individual company confidential data.
[4] Pioneer district lies in both Gila and Pinal Counties.
[5] Ellsworth district lies in both Maricopa and Yuma Counties.
[6] Old Hat district lies in both Pima and Pinal Counties.
[7] Includes placer production by districts as follows: Wickenburg—2 fine ounces gold (value, $70); Lost Basin—6 fine ounces gold ($value, $210) and 1 fine ounce silver (value, $1); Quijotoa—2 fine ounces gold (value, $70); Hassayampa—6 fine ounces gold (value, $210) and 1 fine ounce silver (value, $1); Trigo—78 fine ounces gold (value, $2,730) and 6 fine ounces silver (value $5).

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals**

| Source | Number of mines [1] | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Lode ore: | | | | | | | |
| Dry gold | 23 | 1,459 | 355 | 478 | 31,600 | 100 | ---------- |
| Dry gold-silver | 10 | 88,709 | 649 | 15,237 | 1,542,400 | 3,200 | ---------- |
| Dry silver | 34 | 40,528 | 13 | 22,224 | 778,100 | 11,400 | 700 |
| Total | 66 | 130,696 | 1,017 | 37,939 | 2,352,100 | 14,700 | 700 |
| Copper | 104 | 60,468,580 | 119,435 | 3,963,579 | 935,039,400 | 12,600 | 38,100 |
| Copper-lead-zinc | 7 | 4,309 | 3 | 46,354 | 198,100 | 600,200 | 890,100 |
| Copper-zinc | 3 | 75,957 | ---------- | 31,231 | 3,183,400 | 5,000 | 5,722,300 |
| Lead | 20 | 5,977 | 114 | 27,543 | 31,000 | 2,224,100 | 147,400 |
| Lead-zinc | 9 | 356,283 | 25,437 | 1,071,595 | 1,298,000 | 21,141,400 | 43,705,100 |
| Zinc | 1 | 2,132 | 8 | 523 | 38,600 | ---------- | 656,300 |
| Total | 135 | 60,913,238 | 144,997 | 5,140,825 | 939,788,500 | 23,983,300 | 51,159,300 |
| Other "lode" material: | | | | | | | |
| Copper smelter cleanings and cleanings | 2 | 348 | 2 | 90 | 24,700 | ---------- | ---------- |
| Copper precipitates | 9 | 53,505 | ---------- | ---------- | 69,637,200 | ---------- | ---------- |
| Tungsten ore | 1 | ---------- | ---------- | 323 | 13,500 | ---------- | ---------- |
| Total | 12 | 53,853 | 2 | 413 | 69,675,400 | ---------- | ---------- |
| Total "lode" material | 194 | 61,097,787 | 146,016 | 5,179,177 | 1,011,816,000 | 23,998,000 | 51,160,000 |
| Gravel (placer operations) | 5 | ---------- | 94 | 8 | ---------- | ---------- | ---------- |
| Total, all sources | 199 | 61,097,787 | 146,110 | 5,179,185 | 1,011,816,000 | 23,998,000 | 51,160,000 |

[1] Detail will not necessarily add to totals because some mines produce more than 1 class of material.

**TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals**

| Type of material processed and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Amalgamation [1] | 9 | 2 | ---------- | ---------- | ---------- |
| Cyanidation [1] | 3,866 | 46,490 | ---------- | ---------- | ---------- |
| Total recoverable in bullion | 3,875 | 46,492 | ---------- | ---------- | ---------- |
| Concentration, and smelting of concentrates [1 2] | 108,695 | 3,978,131 | 820,489,500 | 21,807,100 | 50,974,900 |
| Direct-smelting: | | | | | |
| Ore | 33,444 | 1,154,464 | 62,680,600 | 2,190,900 | 185,100 |
| Smelter cleanings, etc | 2 | 90 | 24,700 | ---------- | ---------- |
| Copper precipitates [3] | ---------- | ---------- | 69,637,200 | ---------- | ---------- |
| Total | 33,446 | 1,154,554 | 132,342,500 | 2,190,900 | 185,100 |
| Other: Straight leaching of copper ore [4] | ---------- | ---------- | 58,984,000 | ---------- | ---------- |
| Placer | 94 | 8 | ---------- | ---------- | ---------- |
| Grand total | 146,110 | 5,179,185 | 1,011,816,000 | 23,998,000 | 51,160,000 |

[1] Ore only; no old tailings, etc., processed by this method in 1956.
[2] Includes tungsten-ore concentrate.
[3] Distributed as follows: Cochise County, 7,355,600 pounds; Gila County, 26,262,300 pounds; Greenlee County, 6,739,100 pounds; Pinal County, 29,270,200 pounds; Yavapai County, 10,000 pounds.
[4] All from 1 plant in Gila County.

Digitized by Google

**TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals**

*A. For ore treated at mills*

| | Ore treated (short tons) | Recoverable in bullion | | Concentrate shipped to smelters and recoverable metals | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Concentrate (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | | | | |
| Cochise | 5,289,548 | | | 370,580 | 14,442 | 291,927 | 90,853,000 | | 5,570,900 |
| Gila | 8,211,803 | 6 | 2 | 141,247 | 1,516 | 126,826 | 88,367,100 | | |
| Graham | 18,449 | | | 3,354 | | 11,118 | 125,900 | 832,000 | 2,370,500 |
| Greenlee | 16,736,483 | | | 449,386 | 9,465 | 796,290 | 246,563,100 | | |
| Mohave | 1,000 | | 6 | 245 | 12 | 1,637 | 35,900 | 26,300 | 55,900 |
| Pima | 13,054,286 | | | 319,165 | 39,249 | 882,549 | 180,545,800 | 3,619,700 | 6,229,400 |
| Pinal | 11,774,381 | 1 | | 432,429 | 22,448 | 861,925 | 199,588,800 | | |
| Santa Cruz | 56,516 | | | 13,160 | 108 | 199,665 | 457,400 | 5,723,900 | 8,883,700 |
| Yavapai | 1,617,452 | 3,868 | 46,484 | 76,736 | 21,455 | 805,668 | 13,952,500 | 11,548,600 | 27,864,400 |
| Yuma | 300 | | | 57 | | 526 | | 56,600 | 100 |
| Total: 1956 | 56,760,218 | 3,875 | 46,492 | 1,806,359 | 108,695 | 3,978,131 | 820,489,500 | 21,807,100 | 50,974,900 |
| 1955 | 48,537,958 | 2,720 | 31,733 | 1,619,458 | 92,218 | 3,474,383 | 746,829,600 | 17,729,700 | 45,078,800 |
| **BY CLASSES OF ORE TREATED** | | | | | | | | | |
| Dry gold | 7 | 9 | 2 | | | | | | |
| Dry silver | 14 | | 6 | 1 | | 62 | | | 100 |
| Copper | 56,321,220 | | | 1,720,329 | 87,113 | 2,874,010 | 815,757,900 | 5,000 | 1,400 |
| Copper-lead-zinc | 4,309 | | | 1,607 | 3 | 46,354 | 198,100 | 600,200 | 890,100 |
| Copper-zinc | 75,957 | | | 11,088 | | 31,231 | 3,183,400 | 5,000 | 5,722,300 |
| Lead | 300 | | | 57 | | 526 | | 56,600 | 100 |
| Lead-zinc | 356,279 | 3,866 | 46,484 | 72,526 | 21,571 | 1,025,102 | 1,298,000 | 21,140,300 | 43,704,600 |
| Tungsten | | | | 42 | | 323 | 13,500 | | |
| Zinc | 2,132 | | | 709 | 8 | 523 | 38,600 | | 656,300 |
| Total: 1956 | 56,760,218 | 3,875 | 46,492 | 1,806,359 | 108,695 | 3,978,131 | 820,489,500 | 21,807,100 | 50,974,900 |
| **BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS** | | | | | | | | | |
| Copper | | | | [1]1,725,696 | 87,118 | [2]2,899,004 | [3]818,722,500 | 8,600 | 63,400 |
| Copper-lead | | | | 1,432 | | 40,777 | 203,700 | 1,206,700 | 49,300 |
| Copper-lead-zinc | | | | 3,763 | 3 | 115,733 | 485,300 | 3,640,500 | 598,600 |
| Copper-zinc | | | | 16 | | 35 | 10,200 | | 2,600 |
| Iron (from lead-zinc ore) | | | | 14 | 1 | 25 | | 100 | |
| Lead | | | | 24,799 | 19,467 | 800,611 | 428,600 | 15,903,500 | 3,507,200 |
| Zinc | | | | 50,639 | 2,106 | 121,946 | 639,200 | 1,047,700 | 46,753,800 |
| Total: 1956 | | | | 1,806,359 | 108,695 | 3,978,131 | 820,489,500 | 21,807,100 | 50,974,900 |

[1] Includes concentrate and contained recoverable metal from tungsten ore.

Digitized by Google

### B. For copper ore treated by straight leaching

| | Ore treated (short tons) | Recoverable metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | |
| Gila | 3,480,652 | | | 58,984,000 | | |
| Total: 1956 | 3,480,652 | | | 58,984,000 | | |
| 1955 | 3,491,853 | | | 59,517,500 | | |

### C. For material shipped directly to smelters

| | Material shipped (short tons) | Recoverable metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | |
| Apache | 5 | | | 300 | | |
| Cochise | 510,279 | 31,607 | 1,031,690 | 58,020,400 | 321,100 | 21,000 |
| Coconino | 4,352 | | 674 | 361,900 | | |
| Gila | 54,613 | 5 | 2,331 | 26,798,000 | | |
| Graham | 125 | 3 | 59 | 6,700 | | |
| Greenlee | 68,029 | 62 | 4,178 | 8,136,700 | | |
| Maricopa | 308 | 7 | 137 | 18,500 | | |
| Mohave | 3,176 | 41 | 448 | 243,400 | 5,100 | |
| Pima | 53,488 | 595 | 39,757 | 2,424,800 | 25,300 | 2,700 |
| Pinal | 117,449 | 577 | 28,117 | 33,445,100 | 237,800 | |
| Santa Cruz | 10,112 | 52 | 31,754 | 313,600 | 1,582,400 | 152,200 |
| Yavapai | 32,401 | 366 | 14,753 | 2,411,700 | 19,200 | 9,200 |
| Yuma | 2,580 | 131 | 656 | 161,400 | | |
| Total: 1956 | 856,917 | 33,446 | 1,154,554 | 132,342,500 | 2,190,900 | 185,100 |
| 1955 | 713,404 | 32,595 | 1,128,058 | 101,862,900 | 1,904,300 | 289,200 |
| **BY CLASSES OF MATERIAL** | | | | | | |
| Dry gold: Crude ore | 1,452 | 346 | 476 | 31,600 | 100 | |
| Dry gold-silver: Crude ore | 88,709 | 649 | 15,237 | 1,542,400 | 3,200 | |
| Dry silver: Crude ore | 40,514 | 13 | 22,156 | 778,100 | 11,400 | 600 |
| Copper: | | | | | | |
| Crude ore | 666,708 | 32,322 | 1,089,569 | 60,297,500 | 7,600 | 36,700 |
| Cleanings and smelter cleanings [1] | 348 | 2 | 90 | 24,700 | | |
| Precipitates | 53,505 | | | 69,637,200 | | |
| Lead: Crude ore | 5,677 | 114 | 27,017 | 31,000 | 2,167,500 | 147,300 |
| Lead-zinc: Crude ore | 4 | | 9 | | 1,100 | 500 |
| Total: 1956 | 856,917 | 33,446 | 1,154,554 | 132,342,500 | 2,190,900 | 185,100 |

[1] Combined to avoid disclosing individual output.



Digitized by Google

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content**

| Class of material | Material shipped or treated (short tons) | Gross metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **CONCENTRATE SHIPPED TO SMELTERS** | | | | | | |
| Copper | [1] 1,725,696 | 88,874 | [1] 2,909,489 | [1] 844,501,048 | 14,206 | 1,137,110 |
| Copper-lead | 1,432 | | 40,777 | 254,596 | 1,231,378 | 63,286 |
| Copper-lead-zinc | 3,763 | 3 | 115,733 | 606,514 | 3,714,828 | 767,499 |
| Copper-zinc | 16 | | 54 | 12,684 | 163 | 2,871 |
| Iron (from lead-zinc ore) | 14 | 1 | 25 | 50 | 128 | 355 |
| Lead | 24,799 | 19,467 | 800,611 | 535,797 | 16,228,081 | 4,498,647 |
| Zinc | 50,639 | 3,190 | 185,174 | 833,226 | 1,888,835 | 53,166,002 |
| Total: 1956 | 1,806,359 | 111,535 | 4,051,863 | 846,743,915 | 23,077,619 | 59,635,770 |
| 1955 | 1,619,458 | 94,442 | 3,642,375 | 767,647,793 | 18,898,221 | 52,016,751 |
| **ORE TO STRAIGHT LEACHING PLANT** | | | | | | |
| Copper | 3,480,652 | | | 66,624,771 | | |
| Total: 1956 | 3,480,652 | | | 66,624,771 | | |
| 1955 | 3,491,853 | | | 67,714,874 | | |
| **ORE, ETC., SHIPPED DIRECTLY TO SMELTERS** | | | | | | |
| Dry gold: Crude ore | 1,452 | 346 | 476 | 32,915 | 180 | 16 |
| Dry gold-silver: Crude ore | 88,709 | 655 | 15,608 | 1,668,544 | 5,288 | |
| Dry silver: Crude ore | 40,514 | 13 | 22,156 | 799,221 | 12,090 | 798 |
| Copper: | | | | | | |
| Crude ore | 666,708 | 32,323 | 1,089,662 | 64,874,339 | 12,680 | 271,506 |
| Cleanings and smelter cleanings [2] | 348 | 2 | 90 | 25,245 | | |
| Precipitates | 53,505 | | | 74,482,859 | | |
| Lead: Crude ore | 5,677 | 114 | 27,017 | 39,067 | 2,212,005 | 188,968 |
| Lead-zinc: Crude ore | 4 | | 9 | 18 | 1,111 | 631 |
| Total: 1956 | 856,917 | 33,453 | 1,155,018 | 141,922,208 | 2,243,354 | 461,919 |
| 1955 | 713,404 | 32,630 | 1,130,685 | 107,328,167 | 1,951,420 | 663,260 |

[1] Includes concentrate and contained metal from tungsten ore.
[2] Combined to avoid disclosing individual output.

Mining was begun at the San Manuel mine in January 1956, and the rate of production increased gradually through the first 9 months of operation. Mining problems encountered slowed the anticipated rate of increase in output. In October, trouble with the electrical equipment of 1 of the 2 main ore hoists forced a shutdown of that hoist early in November and delayed further production increase. It was anticipated that full production (900,000 tons of ore per month) would be reached by July 1957. The concentrating plant, operated throughout the year, proved its ability to handle full ore production from the mine. The smelter produced its first copper on January 8, 1956. Short runs on accumulated concentrate were made to test the capacity and recover at the smelter.

Production of low-cost precipitate copper at the Ray mine in 1956 (14,934 tons) doubled the 1955 output (7,546 tons), as a result of an expanded leaching program involving the caved areas of the old underground mine. A program begun in December 1955 for increasing the recovery of copper from the ore was completed and ready for

Digitized by Google

operation at the close of the year. The leaching precipitating, and flotation sections of the mill, were improved and the plants for producing, from pyrite, the iron residue and sulfuric acid needed in the process were completed. The iron residue is obtained by roasting and reducing pyrite recovered from the mill tailings. The sulfur dioxide gas generated in this process of roasting the pyrite is used for producing the sulfuric acid.

Progress was made on the $40 million program announced at the last annual meeting of stockholders of this company for increasing the productive capacity of the Ray Mines Division 20,000 tons of copper annually. Construction contracts were being let for relocating the various surface facilities to permit enlarging the pit and expanding the capacity of the mill. Construction of the new company smelter at Hayden, scheduled for completion in 1958, to process the copper concentrate and precipitate produced at this division, was underway at the close of the year. Smelting had previously been done by a custom smelter on a cost-plus basis.

The $6.5 million improvement project begun in 1955 by Inspiration Consolidated Copper Co. to rehabilitate and convert the Inspiration concentrator to the dual metallurgical process was nearly completed in 1956, and preparations were made to make the change early in January 1957. The dual process involves extraction by sulfuric-acid leaching of copper from the oxide fraction of the ore. The washed and drained tailing from this operation is then treated by fine grinding and flotation concentration to recover the copper occurring in sulfide form. This change will release a large portion of the capacity of the tankhouse (formerly used exclusively for deposition of the copper extracted from the sulfide-ore fraction by ferric sulfate leaching) for electrolytic refining of anode copper produced by smelting concentrate from the rehabilitated mill on a toll basis.

Pima Mining Co. continued to develop its property as an open pit throughout the year. The conversion from an underground mine to an open pit called for removal of overburden to a depth of 200 feet. Test runs were made at the new 3,000-ton-per-day flotation plant in December 1956. This property will become one of the major copper producers in the State when the anticipated capacity of the mine and mill is reached.

Development at the Christmas mine by the owner, Inspiration Consolidated Copper Co., continued throughout 1956. After the development shaft was deepened from the 900-foot to the 1,400-foot level, intermediate levels were established. Development openings were driven into the O'Carroll bed ore. Diamond drilling was continued, with emphasis on short underground holes.

A DMEA contract for a total of $88,780, with equal participation between Government and the Lewisohn Copper Corp., was executed in October 1956 for exploration for copper at the Peach mine in Pima County.

**Gold.**—A 14-percent increase in the gold output in Arizona in 1956 over 1955 reflected directly the increased production of copper. Eighty-two percent of the gold was recovered as a byproduct of the treatment of copper ore, 17 percent from lead-zinc ore, and the remaining 1 percent mostly from ores of gold and silver.

Six mining operations—Copper Queen and New Cornelia Branches of the Phelps Dodge Corp., Iron King, Magma, San Manuel, and

Digitized by Google

Morenci (in order of output)—furnished 96 percent of the total gold produced in Arizona in 1956. Production gains were reported in 1956 from each of these mines except the New Cornelia Branch. San Manuel was a new producer in 1956 and therefore an addition to Arizona's major gold producers. Substantial outputs of gold recovered from copper ore were reported from the Ray and Copper Cities mines.

**Lead.**—The 22-percent increase in Arizona's lead output in 1956, compared with 1955, resulted primarily from substantial gains in lead production from the Iron King and San Xavier mines. With an output of 5,774 tons of lead in 1956, the Iron King lead-zinc mine, operated by Shattuck Denn Mining Corp., continued to be the leading lead producer in the State. Early in the year additional flotation units were installed in the company 900-ton-per-day mill to improve recovery.

A gain in lead production was also reported by the second-ranking lead producer in Arizona—the Flux lead-zinc mine, operated by the American Smelting and Refining Co. The San Xavier mine, owned by Eagle-Picher Co. and operated by McFarland & Hullinger, reopened in February 1955, remained active throughout that year, and was in continuous operation in 1956. As in 1955, it ranked third in lead output in the State in 1956.

These mines—Iron King, Flux, and San Xavier—together with the Glove (operated by Sunrise Mining Co.) and the Head Center (operated by Athletic Mining Co.) produced 96 percent of the total lead output for Arizona in 1956.

**Manganese Ore and Concentrate.**—The output of manganese ore and concentrate in Arizona increased from 1,444 short tons (gross weight) in 1955 to 42,008 tons in 1956 and had a value of $3.5 million. All of the ore and concentrate produced in 1956 was shipped under the "carlot" program administered by the GSA. Under this program, the minimum acceptable manganese content of the ore or concentrate was 40 percent.

Manganese ore and concentrate production shipped under this program was supplied by 21 operations in 6 counties in Arizona in 1956. Maricopa County, with 9 establishments, was the largest source of production, followed by Mohave County with 6, Yuma County with 3, and Pima, Coconino, and Yavapai Counties with 1 each. The five major producers in the State were Big Horn Mining Co., Herald Mining Corp., Herbert K. Cameron, C. F. Heise, and Mohave Mining and Milling Co.

In addition to this ore produced and marketed under the "carlot" program, one shipment of manganese ore from James D. Akins Co. under the "low-grade" program went to the Butte (Mont.) Government (GSA) Purchase Depot from the Confusion No. 1 mine in Yuma County. Requirements governing the purchase of ore under this program were that it be of domestic origin, be amenable to beneficiation, and have a manganese content of 15 percent or more. Ore valued at $5.3 million was shipped from Arizona deposits to the Deming, N. Mex., and Wenden, Ariz., Government (GSA) Purchase Depots under this program in 1955 until the 6-million recoverable long-ton-unit quota for each depot was filled. This ore will be recorded as production in the year in which it is treated and a useful product shipped.

Digitized by Google

**Mercury.**—Mercury output in Arizona in 1956 was only a fraction of that in 1955. This drop resulted partly from the decline in the market price for mercury. Production in 1956 came from 2 operations in Gila County and 4 in Maricopa County. The major part of the total output was produced by Arizona Mining & Development Co., Inc., and Oneida Mining Co., with operations in Gila and Maricopa Counties, respectively.

**Molybdenum.**—Molybdenum production in Arizona in 1956—all recovered as a byproduct of copper ores—was 60 percent above that in 1955. The value of the output had an even greater increase (77 percent) owing to a rise in price of molybdenum in 1956. Output in 1955 came from three mines—Bagdad, Miami, and Morenci. Two mines were added to the Arizona molybdenum producers' list in 1956, when the Silver Bell unit installed a molybdenum section in its 7,500-ton flotation mill at Silver Bell and began producing molybdenum, and when the first production was reported from the San Manuel mine—a new copper producer in 1956. The molybdenum production from these two new sources, with increased output from both the Miami and the Morenci mines, explained the substantially increased output in the State in 1956. Morenci continued to be by far the leading molybdenum producer in Arizona.

**Rare-Earth Metals.**—For the first time in the history of Arizona production and sale of rare-earth metals was recorded; 150 pounds of euxenite was produced at Ed's Camp, Aquarius district, Mohave County, by Lowell L. Edgerton. This material was sold to the Federal Bureau of Mines for research at the Rare and Precious Metals Experiment Station, Reno, Nev.

**Silver.**—Like gold, the 12-percent increase in silver output in 1956 over 1955 directly reflected the gain in copper production in Arizona. Seventy-six percent of the silver output in 1956 was recovered from material classed as copper ore, 21 percent from lead-zinc ore, and 2 percent from copper-lead-zinc, copper-zinc, lead, and zinc ores. Over half of the remaining 1 percent of the total silver output in Arizona came from silver and gold ores. The Copper Queen Branch operation at the Copper Queen underground and the Lavender open-pit copper mine continued to be by far the largest silver producers in the State, followed (in order of output) by the Iron-King lead-zinc mine and the Morenci, New Cornelia, Magma, and Ray copper mines.

**Tungsten.**—Tungsten-concentrate (60-percent $WO_3$ equivalent) production in Arizona in 1956 virtually equaled the output in 1955 despite a 3-month interruption in the Government tungsten-purchase program. Quotas under this program were filled about June 1, 1956. In July Public Law 733 was enacted, extending the program under a limitation of the purchase of 5,000 short-ton units per month from any 1 mine district, with the reduced price of $55 per short-ton unit of $WO_3$, compared with $60 under the original program. Actual acceptance of concentrate under the new program did not begin until August 31.

Tungsten concentrate was produced in six counties—Cochise, Mohave, Pima, Pinal, Yavapai, and Yuma. The value of output from two of these counties—Mohave and Yavapai—together represented 73 percent of the total value of the tungsten produced in the State. The Dye & Bathrick operation at the Boriana mine in Mohave County and Hillside Mining & Milling Co. operations at the

Digitized by Google

Black Pearl and Tungstona mines in Yavapai County were by far the leading tungsten producers in the State. Other major tungsten producers were Hual Pai Co. in Mohave County, Tideland Oil Co. in Pima County, and the Don Leiberman Enterprises, Inc., in Pinal County.

**Uranium.**—Production of uranium ore from Arizona mines between July 1955 and June 1956 amounted to 212,000 tons, with an average grade of 0.25 percent contained $U_3O_8$. The State tonnage for the period represented 10 percent of the domestic total. Production information is based on data supplied to the Bureau of Mines by the AEC. Ore production, by counties, is shown in table 14.

Arizona-ore reserves, as of November 1, totaled 2.6 million tons, with an average grade of 0.30 percent contained $U_3O_8$.[3] The reserves given included measured, indicated, and inferred ore. All but a small percentage of the ore was in Apache and Coconino Counties.

**TABLE 14.—Mine production of uranium ore July 1955–June 1956** [1]

| County | July–December 1955 | | | January–June 1956 | | |
|---|---|---|---|---|---|---|
| | Number of properties | Ore (short tons) | $U_3O_8$ contained (pounds) | Number of properties | Ore (short tons) | $U_3O_8$ contained (pounds) |
| Apache | 59 | 81,645 | 424,489 | 40 | 77,787 | 412,322 |
| Cochise | | | | 1 | (2) | (2) |
| Coconino | 3 | (2) | (2) | 42 | 33,127 | 145,812 |
| Gila | 14 | 3,809 | 11,461 | 10 | 3,758 | 12,652 |
| Graham | 1 | (2) | (2) | | | |
| Maricopa | 3 | (2) | (2) | 1 | (2) | (2) |
| Mohave | 1 | (2) | (2) | | | |
| Navajo | 3 | (2) | (2) | 8 | 4,620 | 29,664 |
| Pima | 1 | (2) | (2) | 2 | (2) | (2) |
| Santa Cruz | 1 | (2) | (2) | | | |
| Yavapai | 2 | (2) | (2) | | | |
| Undistributed | | 7,111 | 33,798 | | 122 | 177 |
| Total | 88 | 92,565 | 469,748 | 104 | 119,414 | 600,627 |

[1] Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

In July a 250-ton-per-day uranium mill was placed in operation at Tuba City, Coconino County, by Rare Metals Corp. of America. The new mill (Arizona's first) treated uranium ores from the nearby Cameron area and alleviated the district's major problem of long haulage to other processing plants.

One buying station operated in conjunction with the mill at Tuba City, and a second operated at Cutter, near Globe, in Gila County.

Uranium ore from Arizona mines, particularly those in Apache County, also supplied a substantial portion of the material fed to the mills at Durango, Colo., and Shiprock, N. Mex.

Exploration and development-drilling activity in the State declined markedly during the year, dropping to one-fifth of the 1955 footage.

A DMEA contract, amounting to $26,788, for uranium exploration in Gila County was executed. Government participation was 75 percent.

According to the State mine inspector's report for 1956, approximately 400 men were mining uranium ore in Arizona; the employment figure given excludes men employed at the Tuba City mill.

[3] AEC, Statistics on Domestic Uranium Production and Ore Reserves: Press Release 178 (Grand Junction, Colo., office), Dec. 18, 1956.

Digitized by Google

**Vanadium.**—Vanadium recovered from uranium ores originating in Apache County were processed at the mill in Durango, Colo. Most of this ore was derived from the Monument No. 2 mine. Ores from other counties in Arizona or ores processed at Shiprock, N. Mex. and at Monticello, Utah, were not treated for vanadium recovery during 1956.

**Zinc.**—In 1956 zinc production continued the upward trend begun in 1955 following the low point reached in 1954. Output in 1956 was 13 percent above 1955, and value of zinc output showed a 26-percent increase because of the rise in price. Zinc production from the State's leading producer in 1956—Iron King mine operated by Shattuck Denn Mining Corp.—was increased 2,698 tons, or 24 percent above the 1955 output. Other major zinc producers that ranked second and third in output, respectively, were the Flux mine, operated by American Smelting and Refining Co., and the Johnson Camp Unit-Moore Shaft mine, operated by Coronado Copper & Zinc Co.

The number four zinc producer—San Xavier mine, owned by the Eagle-Picher Co. and operated by McFarland & Hullinger—had a substantial gain in zinc output in 1956 (2,786 tons) compared with 1955 (1,310 tons). Although its zinc output dropped considerably in 1956, the Athletic Mining Co. Head Center mine was the fifth ranking zinc producer in the State.

## NONMETALS

**Asbestos.**—In the production of asbestos Arizona ranks second among the States and is exceeded only by Vermont. There were only three States that produced chrysotile in 1956—Vermont, Arizona, and California—and only North Carolina reported production of amphibole.

Total sales of asbestos in Arizona during 1956 dropped 24 percent below 1955, owing largely to a reduction in the output of short-fiber material. On the other hand, the overall shipments of the better grades gained. Grade 1 increased 38 percent over 1955; and, although Grade 2 declined moderately, Grade 3 increased 30 percent.

The overall decline in total output can be attributed largely to withdrawal of the Western Chemical Co. from asbestos production in Arizona. The company sold its holdings at the Chrysotile mines to American Fiber Corp. in May, and the output from the mill, which reprocessed tailings and low-grade rock for several years, was curtailed. On the other hand, the increases in sales of Grades 1 and 3 resulted from larger shipments, chiefly by Metate Asbestos Corp., American Fiber Corp., Jaquays Mining Corp., and Kyle Asbestos Mines of Arizona. In order of importance, the major producers were American Fiber Corp., Jaquays Mining Corp., Metate Asbestos Corp., and Western Chemical Co.

A local outlet for the mine and mill production of the region continued with operation of the Government Globe, Ariz., Purchasing Depot operated by GSA which bought Grades 1, 2, and 3 fiber. The results of an extensive field survey of all known occurrences of chrysotile asbestos deposits in Arizona were summarized and published during the year.[4]

**Cement.**—As a result of demand for cement by the Arizona construction industry, shipments of Types I and II portland cement advanced 31 percent over 1955. In the 2-year period 1955–56 the

[4] Stewart, L. A., Chrysotile-Asbestos Deposits of Arizona: Bureau of Mines Inf. Circs. 7706, 124 pp., and 7745, 41 pp.

Digitized by Google

Rillito plant of the Arizona Portland Cement Co. increased its shipments 52 percent. To supply raw materials for manufacturing cement the company quarried a significant tonnage of limestone and purchased gypsum, iron ore, and iron slag. Three kilns were in operation for 335 days, and all electrical energy was generated at the plant site. Thirty-five men were engaged in limestone quarrying and crushing, and 83 men were utilized in cement, auxiliary, and administrative operations at the plant.

Reportedly the Arizona Portland Cement Co. planned to shut down 1 of its 3 kilns because the State's cement shortage was near an end. The company had constructed a third kiln during the summer of 1955 to boost daily production to meet this demand. It was also reported that by year end the company was purchasing 1,000 to 1,500 tons of reverberatory slag per month from the Phelps Dodge copper smelter at Douglas. The slag was used as a source of iron for making cement clinker and replaced purchases from out-of-State sources. Construction of a 5,000-barrel-per-day cement plant reportedly was planned for the Clarkdale area by the Verde Valley Industries. The new plant was planned partly in anticipation that demand for cement would be increased by construction of the Glen Canyon Dam in northern Arizona.

**Clays.**—The total output of clays in Arizona during 1956 declined from 1955 owing mainly to decreased production of bentonite and miscellaneous clay. Although, in terms of tonnage, miscellaneous clay ranked first, production of bentonite at the Cheto open pit produced the greater proportion of the total value. The Alba Mining Corp. (subsidiary of Filtrol Corp.) and Silicates Corp. continued to be the only bentonite producers in the State; Arizona ranked fifth out of 14 States reporting bentonite production in the United States. Bentonite from Apache and Yavapai Counties was used in oil refining, filtering and decolorizing, and cosmetics. Miscellaneous clay was produced because of the need for clay for manufacturing building brick and other heavy clay products. Wallapai Brick & Clay Products, Inc., and Western Clay Products Co., Inc., in Maricopa County and Grabe Brick Co., Louis DeVry & Son, and Tucson Pressed Brick Co. in Pima County were the only producers of miscellaneous clay. A small quantity of fire clay was mined by the Gila Pottery Co., Gila County, for use in manufacturing art pottery and floor and wall tile.

**Diatomite.**—Diatomite deposits near Mammoth, Pinal County, operated by Superlite Builders Supply Co. in 1955, were not worked during 1956.

**Feldspar.**—The production of crude feldspar in 1956 by the International Minerals & Chemical Corp. near Kingman remained about the same as in 1955. Crude ore was ground at the company plant at Kingman and used in producing pottery and enamel. The ground product was shipped to California, Colorado, Louisiana, New York, Pennsylvania, and Washington and exported to Canada and Mexico.

**Gem Stones.**—The value of collected gem or ornamental stones in Arizona in 1956 rose to $104,000 and outranked, in terms of value, the output of beryl, coal, feldspar, mercury, and natural gas. Gem or ornamental stones were reported in 12 counties, with Gila County heading the list of important producing areas. Navajo County ranked second, followed by Yuma, Greenlee, and Yavapai Counties.

Digitized by Google

In terms of value, petrified wood was the most important item, followed by turquois and jasper. Chalcedony, chrysocolla, amethyst, serpentine, peridot, jasper, sagenite, fluorite, obsidian, rhyolite, and white jade also were reported.

**Gypsum.**—Owing largely to the January 1956 opening of a new gypsum-products plant by the Union Gypsum Co. of Phoenix, output of crude gypsum in Arizona jumped to 96,000 tons valued at $366,000—the highest in the history of the State. Crude ore continued to be mined by the Arizona Gypsum Corp. mainly as a cement retarder, and agricultural gypsum production was reported by Garcia & Peters Gypsum Co. All mines were open pits, and all were in Pinal County.

**Lime.**—Production of lime in Arizona in 1956 paced the overall industrial growth and development of natural resources. Total output of quick and hydrated lime rose to 127,000 tons, a 13-percent increase over 1955. The entire output came from four plants—Paul Lime Plant (Cochise County), Hoopes & Co. (Gila County), Phelps Dodge Corp. (Greenlee County), and United States Lime Products Corp. (Yavapai County). Quicklime production was the bulk of the output. The quicklime output of Phelps Dodge Corp. was used in treating base-metal ores. The remainder was sold by producers and also used in milling base-metal ores, steel blast and open-hearth furnaces, water purification, paints, manufacture of silica brick, insecticides, fungicides, and disinfectants, and treatment of sewage and other wastes. Seven rotary kilns and 2 continuous and 1 batch hydrator were fired by natural gas and fuel oil during 1956, and the annual lime-burning capacity of the industry was approximately 150,000 tons.

**Mica.**—What little remained of the mica industry in 1955 dissolved in 1956, when the mines and grinding plant of Buckeye Mica Co. ceased operation. The dry-grinding plant at Buckeye, Maricopa County, operated for many years on ore extracted from its own mines as well as scrap mica purchased from independent operators. Increasing production costs both at the mine and mill, and the cost of shipping ground mica to west coast markets caused the shutdown.

**Perlite.**—Production of crude perlite in Arizona in 1956 increased 51 percent over 1955, continuing the ascent begun in 1955. As in 1955, Perlite Industries of Arizona, Inc., was the mainstay of the industry, reporting a 47-percent increase in crude output. The bulk of the company mine production from Maricopa County was sold to the Sil-Flo Corp. of Fort Worth, Tex., but a company-owned expanding plant at Phoenix produced 1,000 tons of expanded perlite used in plaster aggregate and concrete roof decks. Increased crude production was also reported by Superior Industries, Inc., which operated the Mary T open pit near Superior, Pinal County. After crushing at the mine, crude perlite was shipped to Lake Zurich, Ill., where it was expanded on a toll basis by the Lake Zurich Concrete Products Co. The expanded material was then manufactured into a filter-aid product and distributed by Superior Industries, Inc., at Lake Zurich, Ill. Expanded perlite produced from ore extracted from the Kermit Lee mine operated by Lee's Perlite Industries, Inc., of Casa Grande was sold locally for use as plaster and concrete aggregate and for insulation purposes.

**Pumice.**—Superlite Builders Supply Co. continued to operate the Cruise cinder pit near Ashfork, Yavapai County, and was the principal

Digitized by Google

producer of volcanic scoria in 1956. The total output reached 115,000 tons in 1956 and represented a 25-percent increase over 1955. Crude production also was reported by Christensen Construction Co. in Maricopa County and Gila Valley Block Co. in Graham County. All scoria mined in 1956 was utilized in manufacturing concrete block or as concrete aggregate.

**Sand and Gravel.**—In terms of value sand and gravel produced in Arizona ranked fourth among all minerals produced compared with second place in 1955 due to an increase in the value of zinc and cement in 1956. However, the output of sand and gravel in 1956 rose to 7.9 million tons valued at $6.2 million, a 2-percent gain. Commercial production was recorded at 3.6 million tons, whereas Government-and-contractor output was 4.3 million tons. Building construction—industrial and residential—as well as highway construction, continued at a high level and was responsible for the sustained productive activity in this industry. Maricopa County continued to be the leading producing region accounting for 35 percent of the total output. Pima was second, followed by Gila, Pinal, and Coconino, The five leading commercial producers were Glendale & Superior Sand & Gravel Divisions of Fisher Contracting Co., Union Rock & Materials Co., Acme Materials Co., Arizona Sand & Rock Co., and San Xavier Rock & Sand Co. An average of 413 men was employed by commercial producers, and the average length of employment was 225 days.

**Stone.**—Stone production in Arizona increased from 1,601,000 tons in 1955 to 1,623,000 tons in 1956 and consisted of 1,067,000 tons of crushed limestone, 346,000 tons of crushed sandstone, 95,000 tons of crushed miscellaneous stone, 91,000 tons of crushed granite, 21,500 tons of dimension sandstone, 2,000 tons of crushed marble, and 600 tons of crushed basalt.

The end uses which consumed 98 percent of the total production were cement, flux, lime, concrete aggregate, and riprap. Additional end uses reported were refractories, enamel, pottery, porcelain and tile, terrazzo, roof granules, and plaster. Dimension sandstone was used for rough construction and architectural building stone, dressed stone, flagging, and rubble. The major producing areas were Pima, Cochise, Greenlee, Yavapai, and Maricopa Counties.

**Vermiculite.**—The continued operation of the Glendale plant of Ari-Zonolite Co. resulted in the production of a significant quantity of exfoliated vermiculite during 1956. The crude ore was from out-of-State sources.

### MINERAL FUELS

Two mines, 1 each in Coconino and Navajo Counties, reported coal production totaling 10,060 tons in 1956.

Five wells were drilled for oil and gas in the State during 1956—3 in Apache County and 1 each in Mohave and Navajo Counties. Two of the wells in Apache County were successful and resulted in discovery of the Bita Peak and North Toh-Atin gasfields.

## REVIEW BY COUNTIES

**Apache.**—Apache County furnished almost all of Arizona's bentonite production in 1956. The major producer continued to be the Alba Mining Corp. (Filtrol Corp.), which operated the Cheto mine near

Digitized by Google

Sanders. Crushed granite produced by Wylie Bros. as contractor for the Federal Bureau of Indian Affairs was the second most important mineral commodity, followed by agate collected by the Peridot Gem Shop from the St. Johns region. A small quantity of copper was recovered from ore shipped from the Navajo Reservation claim by Rodgers Mining Co. to the International Smelting and Refining Co. smelter at Miami.

Three wildcat wells were completed in Apache County in 1956 and resulted in discovery of two gasfields. El Paso Natural Gas Co. and Stanolind Oil & Gas Co. were credited with discovery of the Bita Peak gasfield, which yielded a daily flow of 20 million cubic feet of gas on initial testing. Production was from the Paradox formation.

Gas flow from two zones of the Paradox formation was also reported by Franco Western Oil Co. at the North Toh-Atin field discovery.

Farther westward a dry hole was completed by Hancock Oil Co.

During the first 6 months of the year, shipments of uranium ore were made from 40 properties in Apache County. The more important

**TABLE 15.—Value of mineral production in Arizona, 1955–56, by counties**

| County | 1955 [1] | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Apache | $731,066 | $594,583 | Clays, stone, gem stones, copper. |
| Cochise | 49,677,664 | 68,344,273 | Copper, gold, silver, zinc, stone, lime, lead, tungsten concentrate, gem stones. |
| Coconino | 64,045 | 338,869 | Copper, stone, manganese ore and concentrate, sand and gravel, coal, silver. |
| Gila | 66,684,347 | 76,692,000 | Copper, asbestos, molybdenum, lime, sand and gravel, silver, gold, stone, gem stones, mercury clays. |
| Graham | 674,745 | 531,609 | Zinc, lead, copper, silver, pumice and pumicite, gem stones, gold. |
| Greenlee | 95,328,130 | 111,374,672 | Copper, molybdenum, silver, lime, gold, stone, gem stones, sand and gravel. |
| Maricopa | 3,315,210 | 3,959,377 | Sand and gravel, manganese ore and concentrate, clays, stone, pumice and pumicite, mercury, copper, gem stones, gold, silver. |
| Mohave | 427,067 | 1,873,189 | Manganese ore and concentrate, tungsten concentrate, stone, copper, feldspar, zinc, lead, gold, silver, rare-earth minerals, gem stones. |
| Navajo | 104,443 | 125,819 | Sand and gravel, coal, gem stones. |
| Pima | 82,748,688 | 91,431,712 | Copper, cement, gold, sand and gravel, zinc, silver, stone, lead, manganese ore and concentrate, molybdenum, clays, tungsten concentrate, gem stones. |
| Pinal | 56,209,900 | 101,723,680 | Copper, gold, silver, molybdenum, gypsum, perlite, sand and gravel, tungsten concentrate, lead, stone, gem stones. |
| Santa Cruz | 2,324,005 | 2,927,728 | Zinc, lead, copper, silver, gold. |
| Yavapai | 16,510,609 | 16,063,526 | Copper, zinc, lead, gold, silver, lime, stone, pumice and pumicite, manganese ore and concentrate, tungsten concentrate, molybdenum, sand and gravel, beryllium concentrate, gem stones, clays. |
| Yuma | 99,088 | [1] 331,363 | Manganese ore and concentrate, copper, tungsten concentrate, sand and gravel, lead, gold, gem stones, silver, zinc. |
| Undistributed | 4,332,066 | [2] 10,544,641 | |
| Total [3] | 378,277,000 | 485,751,000 | |

[1] Excludes value of manganese ore sold and blended at Government low-grade stockpiles for future beneficiation. (All counties except Navajo had shipments to General Services Administration Purchase Depots in 1956.)

[2] Includes sand and gravel, vanadium, stone, gem stones, natural gas, and uranium.

[3] Total has been adjusted to eliminate duplication in the value of raw materials used in the manufacture of cement and lime.

Digitized by Google

of these properties, in terms of production, were the following:

| Property: | *Operator* | *Area* |
|---|---|---|
| AT-49-1-305 | Benally, Pettigrew, Simpson, and VCA. | Southwestern Carrizo Mountain. |
| Cisco No. 1 | Walter Duncan | Southern Lukachukai Mountain. |
| Frank No. 1 | Frank Nacheenbetah | Northern Lukachukai Mountain. |
| Mesa No. 3 | Kerr-McGee Oil Industries, Inc. | Do. |
| Monument No. 2. | Vanadium Corp. of America. | Comb Ridge. |
| Tract No. 1 | Cato Sells | Do. |

These 6 properties produced 91 percent of the county total for the 6-month period. Ore from Apache County was shipped primarily to Durango, Colo., and Shiprock, N. Mex. Ore shipped to Durango was also treated to recover vanadium.

Approximately 230 men were actively engaged in mining uranium ore in Apache County during 1956, according to the State mine inspector's annual report.

**Cochise.**—Cochise was the largest gold- and silver-producing county in Arizona; it was also fourth in zinc and fifth in lead and copper production. The value of the copper output was 95 percent of the total value of the mineral production in the county. Production of copper advanced 23 percent, compared with 1955. This increase caused a proportional gain in gold and silver production because these metals were recovered primarily as byproducts of copper mining. Lead production dropped slightly, but the decline in zinc output was significant (21 percent).

The Copper Queen Branch of the Phelps Dodge Corp. continued to rank first, in terms of total value of mineral output, in the county and held first place in gold and silver production and second in copper output in the State. Its copper production was up 24 percent above 1955. Part of this increase came from a gain in output from the Copper Queen underground mine, but most of it resulted from an advance from the Lavender open-pit mine. Production data for each mine are shown in table 4. According to the company annual report, the concentrator at the Copper Queen Branch treated 145,163 tons of ore from the underground mine and 5,068,987 tons of ore from the open-pit mine. This ore yielded 359,699 tons of concentrate, which was shipped to the corporation Douglas reduction works for smelting. The precipitation plant, built to treat the liquors from the leach dumps, was put in operation during the early part of the year, and 4,810 tons of precipitates was shipped for smelting.

The Johnson Camp mine produced the second largest quantity of copper in the county and was the 14th ranking copper and 3d ranking zinc producer in the State in 1956. The Cyprus Mines Corp., in its annual report to stockholders for 1956, reported that the Coronado Copper & Zinc Co., which it solely owned, mined and milled 75,398 tons of ore at the Johnson Camp mine. This ore yielded 5,268 tons of copper concentrate and 5,629 tons of zinc concentrate. In addition, 1,281 tons of oxidized copper ore averaging 7.9 percent copper was mined and shipped direct to smelter. Recalculations of the ore reserve at year end indicated an estimated 135,000 tons of ore averaging 2.5 percent copper and 6.4 percent zinc.

In addition to the larger quantities of gold, silver, copper, lead, and zinc recovered from the two major mining operations—Copper Queen Branch and Johnson Camp—smaller quantities of these metals came

Digitized by Google

from nine other active mines in the county in 1956. Of these, the Shannon mine, operated by the Shannon Mining Co., produced the largest quantity. A total of 13,626 tons of ore containing 874 ounces of gold, 21,478 ounces of silver, and 648 tons of copper was mined and shipped directly to the smelter. The Costello, Great Western, and Nevada-Mascot mines were other outstanding producers.

Nonmetal production in Cochise County reached a value of $1.4 million in 1956, compared with $1.1 million in 1955. This continued rise in value of output can be attributed mainly to increased production of lime and stone. Paul Lime Plant at Douglas reported a 10-percent rise in the output of hydrated lime and quicklime. The bulk of the plant production was hydrated lime and quicklime for chemical and industrial purposes for use by consumers in Arizona, California, New Mexico, and Texas and for export to Mexico. A variety of stones was quarried in the county in 1956. Crushed sandstone produced from the Ricketts claims by Phelps Dodge Corp. and used as flux at its copper smelter was the most important type. Output of sandstone was also reported by Paul Lime Plant for use as a refractory. This plant crushed limestone and used it in manufacturing lime, as a flux, and as concrete aggregate and roadstone. Crushed marble used as terrazzo and roof granules and in plaster was produced by Ligier Arizona Marble Quarries, Inc., and $50 worth of gem or ornamental stone was reported by the Desert Rose Gift Shop at Eckert.

R. L. Brown and Standard Tungsten Corp. were the two principal tungsten producers in the county in 1956. R. L. Brown sold his product to the International Metals Corp., while Standard Tungsten Corp. sold directly to GSA.

A shipment of uranium ore was made from the Windmill No. 1 claim, operated by Smith & Royston, during the first half of the year.

**Coconino.**—The recorded production of gold and copper, whose combined value was $154,000 or 45 percent of the total value of mineral production in the county in 1956, came from 6 active mines. The largest producer—Petoskey group operated by Jacob Lake Mining Co. from May 1 to October 1—shipped to the smelter 1,855 tons of copper ore that contained 204 ounces of silver and 90 tons of copper.

Nonmetals (sand and gravel and stone) composed only 32 percent of the total value of mineral production in 1956, and dimension sandstone was the only stone recorded as production. Andy Anderson, Joe Ashby, Howard Gray, L. C. Henriken, and G. A. Kopenhefer were the quarry operators, and output consisted entirely of flagging and rubble. Sand and gravel production in 1956 resulted from contract-construction activities of the Federal Bureau of Reclamation, which reported production of 50,000 tons of paving gravel by Ford-Fielding and Union Construction Co.

A substantial quantity of manganese concentrate with a manganese content of more than 40 percent was shipped from the county to the GSA depot under the Government "carlot" program in 1956.

The Cow Springs No. 2 mine, operated by the Lawrence Isaac Coal Co., reported coal production in 1956.

Uranium mining in the Cameron area took a sharp upswing in 1956, with installation of a buying station at Tuba City in January and initial operation of the Rare Metals Corp. of America mill, also at Tuba City, in July. Although exploration activity was intense during the previous year, production had remained relatively small, as

Digitized by Google

operators preferred to delay production until opening of the local buying station rather than face high freight charges inherent in shipping to mills in New Mexico.

Major operations for the first 6 months of the year, in terms of production, were as follows:

| Property: | *Operator* |
|---|---|
| Charles Huskon No. 4 | Utco Uranium Corp. |
| Huskon No. 1 | Arrowhead Uranium Co. |
| Huskon No. 2 | Do. |
| Huskon No. 3 | Do. |
| Jack Daniels No. 1 | Marcy Exploration & Mining Co. |
| Murphy No. 13 | Glasscock, Howell & Riley. |
| Paul Huskon No. 3 | Utco Uranium Corp. |
| Ramco No. 20 | Rare Metals Corp. of America. |
| Yazzie No. 101 | Chessher & Co. |

These nine properties, all in the Cameron area, produced 90 percent of the county total for the half-year period. In all, 42 properties in the county reported shipments during the period.

Men engaged in uranium mining in Coconino County during 1956 numbered 130, and over 50 men were employed at the Tuba City mill in the latter portion of the year.

A description of the 250-ton-per-day mill at Tuba City was published in September.[5]

**Gila.**—The value of minerals produced in Gila County in 1956 increased 15 percent above 1955. Most of this gain resulted from a 15-percent advance in the value of copper production, because copper represented 97 percent of the total value of the mineral output in the county. Four of the 1956 leading copper-producing mines in Arizona, Inspiration (6th), Copper Cities (7th), Miami (10th), and Castle Dome dump (13th) were in Gila County. In addition to copper, other metals produced in the county included gold, silver, and molybdenum, most of which were recovered as byproducts of copper mining. A small quantity of mercury also was produced.

The Inspiration mine, operated by the Inspiration Consolidated Copper Co., continued to be the major copper producer in the county. Mine data are shown in table 4. As in 1955, all ore came from the Live Oak and Thorton pits. Underground activity was limited to ore transportation and collection and pumping leaching-in-place solutions. The ore mined in 1956 contained an average of 0.976 percent copper, of which 0.496 percent was oxide copper and 0.480 percent sulfide copper, according to the company annual report. In 1956, 3.09 tons of overburden was stripped for each ton of ore mined. The most notable feature of the year at this operation was the rehabilitation and reequipment of the concentrator, in preparation for conversion to the dual metallurgical process.

The Copper Cities mine, operated by the Copper Cities Division of Miami Copper Co., was the second ranking copper producer in Gila County in 1956. According to the company report, 27,632 tons of copper was produced from open-pit mining of 4,167,147 tons of ore with a copper content of 0.795 percent. In addition, 194 tons of copper was recovered from precipitate produced at the Burch water-treatment plant, where certain company industrial waters were treated before being used. Precious metal credits from the ore

[5] Argall, George O., Jr., How Rare Metals' New Mill Recovers $U_3O_8$ From Arizona's Painted Desert: Mining World, vol. 18, No. 10, September 1956, pp. 68–73.

Digitized by Google

amounted to $39,379. The waste-to-ore ratio was 0.93 to 1.00 in 1956. Ore reserve was increased to 36.6 million tons, as of January 1, 1957, according to the company, by the addition of 9.5 million tons proved by drilling during the year. This addition slightly lowered the average grade of the reserve.

The Miami mine of the Miami Copper Division of Miami Copper Co. was again the third ranking copper producer in Gila County. Mine data are shown in table 4. Transition of operations from the old section of the mine to the low-grade ore body was nearly completed during the year; all but a small fraction of the ore mined in 1956 came from the low-grade ore body. Copper recovered from acid leaching of previously mined areas of the Miami mine composed 17 percent of the division output. The production of low-cost copper by this method had been carried on for many years and was to be continued long after underground mining is ended. Enlargement and modernization of the precipitation plant to be used in this connection began in 1956, and one section of the new plant was placed in service in March 1957. The company stated that the ore reserve at the close of the year was estimated to be 12.8 million tons. Molybdenum concentrate, recovered by re-treating the copper sulfide concentrate, was marketed by this division. It ranked second in the State as a molybdenum producer.

Activities of the Castle Dome Division of Miami Copper Co. (the fourth ranking copper producer in the county in 1956) were confined to water leaching of the mine dumps left from open-pit operations, which ceased in December 1953.

In addition to these 4 mines, 11 smaller mines reported active in the county produced gold, silver, and copper. Many of these yielded less than 100 tons of ore, and most were operated as part or spare-time jobs or as assessment work only on the claims. Larger producers were Chillito and Copper Hill mines and Interloper and Old Dominion dumps.

Mercury was produced by two operators in Gila County in 1956, Arizona Mining & Development Co., Inc., and Eureka Mining Co. All mercury recovered was sold to Chemical Manufacturing Co., Inc.

Nonmetal mineral commodities produced in 1956 were asbestos, lime, sand and gravel, stone, gem stones, and clays and accounted for 3 percent of the total value of mineral output. Gila County continued to be the only asbestos-producing area in the State; output came from 14 mines and was processed in 4 mills in the vicinity of Globe. Although shipments consisted largely of shorts (Grade 4 and smaller) in 1956, significant gains in the sale of Grades 1 and 3 fiber were noted. The purchase of Grades 1, 2, and 3 by the GSA depot at Globe continued and was the only local outlet for good-quality material. Total shipments for the year were 24 percent below 1955, but the value rose 29 percent. This apparent independent movement of tonnage and value was due to the decline in the quantity of lower priced short fiber produced. The Western Chemical Co., operator of the Chrysotile mines and the major producer of shorts, discontinued mining activity during the year.

The Globe plant of Hoopes & Co. continued to be the only source of lime in the county during 1956. Although the total output in 1956 was slightly below that in 1955, the value of quicklime sold was higher because of increased average price. All production from the one

Digitized by Google

gas-fired kiln was sold for use in the concentration of base-metal ores. Of the 171,000 tons of sand and gravel produced in 1956, 132,000 tons was paving sand and gravel produced by H. J. Hagen Construction Co., John Mercer, and construction and maintenance crews of the county highway department. The remainder was structural sand and gravel, railroad ballast (sand), oil-mix sand, and miscellaneous gravel. The remainder of the county nonmetal output consisted of crushed limestone used in the manufacture of lime and dimension sandstone used as building stone, flagging, and rubble. Gila County continued to be the major producer of gem and ornamental stone in Arizona during 1956. Peridot, agate, chrysocolla, turquois, serpentine, amethyst, and apache tears were collected throughout the county but principally in the Globe-Miami area. Thirteen tons of fire clay was quarried and used in manufacturing pottery and tile by the Gila Pottery Co. of Globe.

During the first 6 months of the year, shipments of uranium ore were made to the Globe buying station from 10 properties in Gila County. More productive of the properties were the Hope No. 3 (Arizona Continental Uranium, Inc.), Lost Dog (Bluebonnet Uranium Corp.), and Lucky Stop No. 2 (Lucky Stop Mining Co.). These three properties produced two-thirds of the ore credited to Gila County in the half year.

**Graham.**—Lead-zinc ore from the Head Center mine in the Aravaipa district, operated by the Athletic Mining Co., continued to be the main source of the value of the mineral production in Graham County in 1956. The company reported that 18,449 tons of ore, containing 1,172,296 pounds of lead and 3,550,770 pounds of zinc, was mined. The ore was treated in the company 100-ton-per-day selective flotation mill and yielded 890 tons of copper-lead concentrate and 2,464 tons of zinc concentrate, which together contained 478 tons of lead, 1,385 tons of zinc, and some silver. Development at the mine in 1956 included 35 feet of shaft, 400 feet of drift, and 350 feet of diamond drilling. Small quantities of gold, silver, and copper were produced by five other active mines in the county in 1956.

Production of volcanic scoria in Graham County during 1956 was only slightly below the 3,400 tons reported in 1955. The Gila Valley Block Co. was the only mine operator, and all output was used by this company in producing concrete block. Three hundred pounds of chalcedony was collected by the Desert Rose Gift Shop and Peter's Rock Shop and was valued at $150.

**Greenlee.**—The value of the copper output in Greenlee County increased from $93 million in 1955 to $108 million in 1956. It accounted for 97 percent of the total value of mineral production in the county in 1956. Substantial quantities of gold, silver, and molybdenum, recovered entirely as byproducts of copper mining, with a combined value of $2.5 million, were produced.

The Morenci mine of the Morenci Branch of the Phelps Dodge Corp. supplied most of the copper, gold, silver, and all of the molybdenum output in the county and was first in copper and molybdenum, sixth in gold, and third in silver production in the State in 1956. Mine data are shown in table 4. The company stated, in its annual report to stockholders, that 16,735,218 tons of ore (an average of 52,135 tons per working day) was treated in its 45,000-ton-per-day concentrator in 1956. The smelter treated 490,501 tons of concentrates. A total

Digitized by Google

of 1,200 tons of molybdenite concentrate was recovered in the molybdenum plant as a byproduct of the copper concentrate.

In terms of value, lime was the most important nonmetal produced in Greenlee County during 1956, and the county continued to rank second in the State as a lime producer. Phelps Dodge Corp. operated a rotary kiln and a continuous hydrator during the year, and all output of quicklime was converted to milk of lime and used in concentrating copper ores. In addition to supplying limestone for manufacturing lime, this company also quarried a significant quantity of crushed limestone as smelter flux and quarried 2,000 tons of dimension sandstone for rubble.

The value of gem and ornamental stones collected in 1956 rose to $5,000 compared with $2,500 in 1955 and consisted of agate, chalcedony, geodes, and jasper. Sand and gravel output in 1956 resulted from quarrying operations of the S & E Truck Co., which reported the production of structural gravel.

**Maricopa.**—The value of output of nonmetals in Maricopa County in 1956 was $2.4 million (60 percent of the total value of mineral production in the county), compared with $3.2 million (96 percent of the total) in 1955. Output in 1956 resulted from shipments and sales of sand and gravel, clays, stone, pumice and pumicite, and gem stones.

Sand and gravel production amounted to 2.8 million tons, of which 2.7 million tons was commercial production and 130,000 tons Government-and-contractor output. In the commercial group Superior & Glendale Divisions of Fisher Contracting Co. and Union Rock & Materials Co. were the major producers. All Government-and-contractor production resulted from quarrying and preparation activities of the county highway department. Total output of miscellaneous clay declined from 78,000 tons in 1955 to 63,000 tons in 1956 as a result of a cutback in quarrying operations of Wallapai Brick & Clay Products, Inc., and Western Clay Products Co., Inc., the only mine operators in the county.

The shift in the location of highway construction resulted in a reduction in the output of stone in Maricopa County during the year. Crushed granite was quarried by Phil Allen Sand & Gravel Co. and South Mountain Granite & Equipment Co. and a small quantity of crushed basalt was quarried by the Arizona Sand & Rock Co.

The operation of the Pre Cast Claims by the Christensen Construction Co. represented the only volvanic-scoria-mining activity in the county during 1956. Output reached 9,200 tons and was used as concrete aggregate.

The collection of gem and ornamental stones in the Ellsworth and Superior districts and Saddle and Superstition Mountains areas was reported by a number of individuals and rock shops. In terms of quantity, agate comprised the bulk of the material collected but dendrite, chalcedony, sagenite, fluorite, and apache tears were also reported. An exfoliated-vermiculite plant continued in operation at Glendale, producing Zonolite for use as an insulating medium.

Manganese ore and concentrate shipped by nine individuals and companies from deposits in Maricopa County to the GSA under the Government "carlot" program was valued at $1.5 million. The four leading producers, which supplied most of the total output, were Big Horn Mining Co., Herald Mining Corp., Joe Gianero, and H. F. Lynn.

465877—58——10

Digitized by Google

A total of 308 tons of ore containing small quantities of gold, silver, and copper was shipped directly to smelters from 10 active mines in the county in 1956; each mine produced less than 100 tons of ore. Two fine ounces of gold was recovered by Carey Phillips by the dry-washing method of placer mining at the Old San Domingo mine.

International Ore Corp., Jesse H. Lochausen, Oneida Mining Co., and C. R. Robbins recovered small quantities of mercury from mines in the county and sold it to the Chemical Manufacturing Co., Inc., during 1956.

**Mohave.**—The value of manganese ore and concentrate output ($1.2 million) made up 66 percent of the total value of mineral production in the county in 1956. Other metals—gold, silver, copper, lead, zinc, tungsten, and rare-earth minerals—together supplied 20 percent of the total value. The remainder (14 percent) came from the nonmetal group—stone, feldspar and gem stones.

Manganese ore and concentrate was shipped from six operations in Mohave County in 1956 under the Government "carlot" program. The combined ore—15,291 short tons (gross weight)—contained an average of 41.4 percent manganese. The two major producers were C. H. Heise, who operated the Priceless mine, and Herbert K. Cameron, who operated the Profit mine.

Of the eight tungsten-producing mines in Mohave County in 1956, the principal one was the Boriana, operated by Dye & Bathrick. Only 1 other mine—the Old Boriana operated by Hual Pai Co.—had an output of $WO_3$ exceeding 100 units. The Wothree mine, one of the larger producers in1955, was active in 1956 on a smaller scale.

Gold, silver, copper, lead, and zinc with a combined value of $135,000 were produced by 11 active mines in the county in 1956. The Downie Lease and Emerald Isle mines, both operated by C. G. Patterson, and the Antler mine, operated by Yucca Mining & Milling Co., were the major producers and the only ones with an output of ore over 500 tons. Tom Godwin sold six fine ounces of gold recovered by placer mining in the county in 1956.

Crushed sandstone (silica quartz) produced by International Minerals & Chemical Corp. near Kingman represented total stone production. The same company accounted for all crude feldspar mined in 1956 and the ground output from the company Kingman mill was used in the manufacture of pottery and enamel. Shipments to California, Colorado, Louisiana, New York, Pennsylvania, and Washington, as well as exports to Canada and Mexico, were recorded. For the first time in the recorded history of the county rare-earth minerals were mined and sold. Lowell L. Edgerton reported the recovery of 150 pounds of euxenite from Ed's Camp, Aquarius district, which was shipped to the Federal Bureau of Mines Rare and Precious Metals Experiment Station at Reno, Nev., for use in research. Fifty pounds of chalk turquois was collected by Volney Striegler from outcrops northeast of Chloride.

Falcon-Seaboard Drilling Co. completed a well in the Antelope Springs area in 1956. It was a dry hole; however, traces of oil were reported from the Mississippian strata.

**Navajo.**—In terms of value, Navajo County was the second-ranking county in the collection of ornamental stone. With the location of the Petrified Forest National Monument within its boundaries, the county was a mecca for tourists and the collection of petrified wood

Digitized by Google

outside of the forest reached 176 tons in 1956. The major collector and dealer was Petrified Wood Products, west of the Petrified Forest near Holbrook. Sand and gravel was the only other nonmetal reported during the year, and output consisted of 25,000 tons of structural, paving, and fill sand and structural, paving, and other gravel produced by Ray Despain and Winslow Sand & Gravel Co.

The Keans Canyon No. 4 mine, operated by the Hopi Indian Agency, reported coal production in 1956.

One dry hole was drilled by Eisele Cronin. No further information was available, other than that the drilling was suspended at year end.

Uranium-ore shipments were reported from eight properties during the first half of the year. Most of the ore was produced from the Moonlight mine near Oljato Creek and the Monument No. 1 mine in the Agathla Peak area.

**Pima.**—The value of mineral production in Pima County in 1956 increased 10 percent ($8.7 million) above 1955. Most of this advance resulted from an 8-percent increase ($5.7 million) in the value of copper output. Copper composed 85 percent ($77.8 million) of the total value of mineral production ($91.4 million) in the county in 1956. Three mines—New Cornelia (third ranking copper producer in the State), Silver Bell (ninth ranking), and Mineral Hill-Daisy-Copper Glance-Bullion No. 2 (twelfth ranking) together supplied 99 percent of the total copper output in the county and 18 percent in the State.

Data on production from the New Cornelia open-pit mine at Ajo in 1955 and 1956 are given under copper in table 9. Additional data on the New Cornelia Branch were presented in the Phelps Dodge Corp. annual report as follows: The ratio of waste to ore was 1.43 : 1.0, the same as in 1955. The concentrator treated 10,092,469 tons of ore during the year—an average of 31,441 tons per working day. The smelter treated 216,402 tons of concentrate from the concentrator during the year.

The Silver Bell Unit (Oxide and El Tiro mines), second largest copper producer in the county, operated by the American Smelting and Refining Co., was active throughout the entire year. A molybdenite section was installed in the 7,500-ton-per-day flotation mill, and a substantial quantity of molybdenite concentrate was recovered and sold to various buyers, mainly for export. Exploration work during the year consisted of 10,536 feet of churn drilling.

The Banner Mining Co. operated the third largest copper producing group of mines in the county, Mineral Hill-Daisy-Copper Glance-Bullion No. 2, throughout the year. An addition was made to the mill to raise the capacity from 500 to 900 tons per day. An extensive exploration and development program, consisting of drifting and raising, and longhole, churn, and rotary drilling, was carried out during the year.

Most of the gold and more than half of the silver output in the county were recovered as byproducts of copper ore from the New Cornelia open-pit mine. The bulk of the lead and zinc output came from San Xavier mine, owned by the Eagle-Picher Co. and leased and operated by McFarland & Hullinger. It was the third-ranking lead- and fourth-ranking zinc-producing mine in the State in 1956. This mine was reopened in February 1955, following a 2-year period of inactivity. In 1956, 32,054 tons of lead-zinc ore was mined and treated in the company 500-ton-per-day flotation mill. The ore yielded 3,515 tons,

Digitized by Google

of copper-lead-zinc concentrate and 5,373 tons of zinc concentrate, which together contained 112,818 ounces of silver, 304 tons of copper, 1,923 tons of lead, and 3,293 tons of zinc.

In addition to the 3 copper mines (New Cornelia, Silver Bell, and Mineral Hill-Daisy-Copper Glance-Bullion No. 2), and the 1 lead-zinc mine (San Xavier) described, 28 lode mines active in the county produced smaller quantities of gold, silver, copper, lead, and zinc. Of this group, the 6 mines that produced over 1,000 tons of ore follow: Papago Chief, Allison, Narragansett, King-Exile, Strong & Harris, and Atlas.

Cement, clays, gem stones, sand and gravel, and stone were the nonmetals produced in Pima County in 1956 and were valued at $9.7 million—11 percent of the total value of all mineral production in the county. As in past years, cement composed the bulk of the value, and all output came from the Rillito plant of Arizona Portland Cement Co. The continued construction boom in this heavily populated county resulted in a continuing demand for sand and gravel and stone. As the second ranking producer of sand and gravel in the State, Pima County operators produced 944,500 tons of sand and gravel valued at $1,030,000. Of this amount, 782,500 tons was commercial production and 162,000 tons Government-and-contractor output. The principal commercial producers were San Xavier Rock & Sand Co., Tucson Rock & Sand Co., L. M. White Construction Co., and Wilmot Sand & Gravel, Inc. Government-and-contractor output was reported by the county highway department and by Flickinger Bros. Construction Co. as contractor for this highway department.

Despite the demand for building material by the construction industry, the output of miscellaneous clay used in manufacturing brick and other structural clay products declined slightly in 1956. The Grabe Brick Co., Louis DeVry & Son, and Tucson Pressed Brick Co., in addition to working open-pit clay mines, operated brick plants at Tucson to supply the needs of the community and surrounding region. Chalcedony was the only ornamental stone reported in 1956, and Allen's Minerals collected 300 pounds from the Tucson Mountains.

Gertrude M. Garen shipped a substantial quantity of manganese concentrate from the Stella Marris No. 1 in Pima County under the Government "carlot" program in 1956.

A total of 1,126 units of $WO_3$ valued at $62,000 was produced from 5 mines in the county; this was a 16-percent increase over 1955. The major producer in 1956 was the Tideland Oil Co. from the Big Banana mine. William Coplen, who operated the Jezebel No. 1 mine, was the next highest producer. The remaining three operators were Wayne Cable, Cordy C. Calvin, and I. M. Whitney.

**Pinal.**—Pinal County supplied 23 percent of the State copper output. Copper accounted for 97 percent ($99 million) of the total value of the mineral production of the county ($101.7 million). Most of this copper came from three mines—Arizona's fourth, fifth, and eighth ranking copper producers, Ray, San Manuel, and Magma, respectively. The remaining 3 percent of the total value of mineral production in the county came from the output of gold and silver (most of which was recovered as byproducts of copper ore), molybdenum (recovered entirely as a byproduct of copper ore), lead from 3 mines, tungsten from 1 operation, and the nonmetals gypsum, perlite, sand and gravel, stone, and gem stones.

Digitized by Google

The county's largest and the State's fourth ranking copper producer—Ray Mines Division of Kennecott Copper Corp.—has been described in detail in the copper section of this report. Table 4 shows the ore mined and copper produced at the Ray mine in 1956 compared with the same data for 1955. This also holds true for the county's second and third ranking copper producers—San Manuel and Magma, respectively. It should be noted that San Manuel was a new mine and new copper producer in 1956. Mining was begun in January 1956 but the year's ore production was below that anticipated because certain mining problems slowed output and trouble developed in the electrical equipment on 1 of the 2 main hoists that caused a shutdown of that hoist for repairs.

In addition to the 3 mines described (Ray, San Manuel, and Magma), 24 other mines active in the county produced smaller quantities of at least 1 of the following minerals—gold, silver, copper, and lead. With only a few exceptions, less than 100 tons of ore was produced from each of these mines. Mines with over 500 tons of ore output included the Prosperity, Copper Butte, and Monitor.

The role played by the mining industry in the production of nonmetals in Arizona was minor during 1956 in comparison to the output of metals. Pinal County was the only source of gypsum and perlite in the State, and sales in 1956 were considerably above those in 1955. The gain in gypsum production was brought about by the continued mining activities of Arizona Gypsum Corp. and the entrance of Union Gypsum Co. into this field. The latter company began operating its gypsum-products plant at Phoenix in January and worked throughout the year. As a result of these mining activities, output of crude gypsum was the highest in the history of the county.

Crude perlite was the second-ranking nonmetal in 1956, and the operation of three open-pit mines by Lee's Perlite Industries, Inc., Perlite Industries of Arizona, Inc., and Superior Industries, Inc., resulted in 51-percent increase in mine production.

Demand for sand and gravel and stone for use in industrial and residential construction remained strong in 1956. The bulk of the sand and gravel produced was reported by the Pinal County Highway Department and the remainder by the Coolidge Sand & Rock Co., which also quarried a small quantity of crushed basalt for use as road metal. On the other hand, all other stone production was quarried by a commercial producer. San Manuel Copper Corp. quarried crushed limestone and sandstone for fluxing purposes. Remaining nonmetal production consisted of chrysocolla, agate, and "apache tears" (volcanic glass), collected largely in the Superior region.

**Santa Cruz.**—Output of the metals, gold, silver, copper, lead, and zinc comprised the entire recorded mineral production in Santa Cruz County in 1956. The yield of each of these metals was greater in 1956 than in 1955, and the total value for all increased 26 percent. Lead and zinc were the most important mineral products; the county ranked second in lead and zinc output in the State in 1956.

The bulk of the lead and zinc came from the Flux mine operated by the American Smelting and Refining Co. The mine was the second ranking lead and zinc producer in the State. A substantial quantity of lead-zinc ore was mined and milled in the company 200-ton-per-day flotation mill. The lead and zinc concentrates were shipped to the company smelters at El Paso and Amarillo, Tex., respectively, where

Digitized by Google

in addition to lead and zinc, substantial quantities of silver and copper were recovered.

The Glove mine near Amado in Santa Cruz County also was an important producer of lead in the county and the State in 1956. The operating company (Sunrise Mining Co.) shipped a substantial quantity of ore from this mine directly to the American Smelting and Refining Co. smelter at El Paso, Tex. Other important gold, silver, copper, lead, and zinc mines included the Duquesne group of claims (operated by nine lessees), Three R, Copper Plate Nos. 1 and 2, Eyes of Ramona, and Alto & Victor.

**Yavapai.**—In 1956 Yavapai County was the leading producer of lead and zinc in Arizona and ranked second in tungsten, third in gold, fourth in silver, and sixth in copper production. Other metals produced in the county included manganese from 1 operation, molybdenum recovered as a byproduct of copper ore from 1 operation, tungsten from 4 mines, and beryl from 3 operations. The combined value of the copper, lead, and zinc output composed $12.6 million (78 percent) of the total value of mineral production in the county.

The Iron King mine—the leading lead and zinc producer in the State—accounted for the major part of the lead and zinc output in the county. According to the operator, Iron King Branch of Shattuck Denn Mining Corp., 253,942 tons of lead-zinc ore, containing 35,362 ounces of gold, 991,927 ounces of silver, 447 tons of copper, 7,230 tons of lead, and 18,984 tons of zinc, was mined and treated in the 900-ton-per-day flotation plant. This ore yielded 48,852 tons of lead and zinc concentrates containing 22,534 ounces of gold, 804,382 ounces of silver, 302 tons of copper, 6,128 tons of lead, and 16,054 tons of zinc. In addition to these lead and zinc concentrates, which were shipped to the American Smelting and Refining Co. El Paso and Amarillo (Tex.) smelters, respectively, precipitate containing 3,866 ounces of gold and 46,484 ounces of silver was recovered from the ore by cyanidation and shipped to the United States Smelting Refining and Mining Co. smelter at Salt Lake City, Utah.

The Bagdad open-pit copper mine, the 11th-ranking copper producer in Arizona, was another important producer in the county in 1956. Molybdenum concentrate was recovered as a byproduct of the copper ore. Data for the Bagdad mine in 1955 and 1956 are shown in table 4. During 1956, 10 tons of overburden was removed for each ton of ore put through the mill. This high ratio was brought about by concentrated effort on stripping to uncover new ore. Eventually this ratio will reduce to 2½ : 1 when the ore that was uncovered goes to the mill. The company reported that the cost of removing overburden was 17.39 cents per ton during 1956. The pilot plant for producing electrolytic copper was operated during the last 6 months of 1956 and at the close of the year was producing 3,000 pounds of electrolytic copper daily. The sulfuric acid, a byproduct of the plant, was used to produce several tons of cement copper from one of the dumps of oxide copper ore. It was planned to install additional ball mills to increase the capacity of the mill to 10,000 tons daily as soon as possible.

Smaller quantities of at least one of the metals (gold, silver, copper, lead, and zinc) were produced from 27 other lode mines in Yavapai County in 1956, in addition to the output of the Iron King lead-zinc

Digitized by Google

and Bagdad copper mines described. The Big Hole Mining Co. had a sizeable output of copper ore from the United Verde open-pit mine, as did Fred D. Schemmer from the Commercial mine. Of the remaining 25 small operations, only 8 produced over 100 tons of ore.

The Hillside Mining & Milling Co. had a substantial output of tungsten ore from two mines—Black Pearl and Tungstona—in the county. Two other tungsten mines (White Pearl and Narcolipsi) were active in the county in 1956.

The Dixie Queen mine, operated by the Dixie Queen Mines, Inc., was the major producer of beryl in the State and county in 1956. Earl F. & Sidney A. Anderson (partnership) and J. E. Boatwright also recovered beryl from pegmatite deposits in Yavapai County. All three producers sold their output to Beryl Ores Co., Arvada, Colo.

Except for gem stones, all nonmetal output in Yavapai County in 1956 was in the construction-materials group. Heading the list of important minerals, in terms of value, was lime manufactured by the United States Lime Products Corp. at Nelson. Both hydrated lime and quicklime were produced for the building and chemical industries. Stone ranked second and consisted of commercial crushed granite and limestone and dimension sandstone. The bulk of the crushed stone produced was used for road construction and the manufacture of lime, and the dimension sandstone as a building stone and for flagging. Volcanic scoria was the third most important construction material produced in 1956; the only producer was the Superlite Builders Supply Co., which operated its Cruise cinder pit. Sand and gravel output reached 35,000 tons, and all production was reported by the Verde Concrete Products, Inc. A small quantity of bentonite was mined by Silicates Corp. from its Curly Mud mine, and agate, white jade, petrified wood, chrysocolla, and jasper were collected from numerous outcrops and surface deposits throughout the county.

**Yuma.**—The value of the manganese ore and concentrate output constituted 60 percent of the total value of the mineral production in Yuma County in 1956. Three operators (Civola Mining Co., J. F. Power, and W. B. Tenney) shipped manganese ore and concentrate under the Government "carlot" program administered by the GSA. Combined, the 2,391 short tons (gross weight) of material averaged 41.4 percent manganese. In addition, one shipment of manganese ore was made by James D. Akins Co. under the "low-grade" program to the GSA, Butte, (Mont.) Purchase Depot, which will be recorded as production in the year it is treated and a useful product shipped.

The Mineral Hills mine, operated by R. A. De Lano Co., was the major producer of copper in the county. A total of 1,652 tons of ore containing 64 tons of copper and a few ounces of gold and silver was mined and shipped directly to the American Smelting and Refining Co. smelter at Hayden and Magma Copper Co. smelter at Superior. Production of 1 or more of the metals gold, silver, copper, lead, and zinc was reported from 21 other lode mines in the county. In addition, small quantities of gold and silver were produced from one placer mine in the county in 1956.

Tungsten output in the county in 1956 was virtually the same as in 1955, despite a decreased number of operations—from 21 in 1955 to 12 in 1956. All had an output of less than 100 units of $WO_3$ except L. C. Hutchmaker at the Pee Wee mine and John P. Brusco at the Three Musketeers mine.

Digitized by Google

The value of nonmetals—sand and gravel and gem stones—continued to decline and was only $19,000 in 1956 compared with $26,000 in 1955. Six thousand tons of structural sand and gravel was quarried by the Valley Sand & Gravel Co. Gem and ornamental stones valued at $6,700 were collected. Stones reported sold in 1956 included jasper, agate, obsidian, rhyolite, and quartz.

Digitized by Google

# The Mineral Industry of Arkansas

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Arkansas Geological and Conservation Commission, Norman F. Williams, Director and State Geologist, Little Rock, Ark.

By Robert S. Sanford [1]

THE VALUE of Arkansas mineral production in 1956 reached an alltime high of $135.2 million—an increase of $2.4 million (1.8 percent) over the previous high in 1955. Severance tax collected on minerals was up 3.4 percent. Declines in bauxite, clays, and natural-gas liquids were more than offset by increases in barite, coal, cement, gem stones, iron ore, natural gas, petroleum, gypsum, lime, manganese, sand and gravel, and stone. Output of liquid, gaseous, and solid fuels, which comprised 67 percent of the total value of State mineral production, increased 2 percent from 1955. The State of Arkansas Oil and Gas Commission regulated petroleum production to prevent too rapid depletion of the State's declining reserves and to curtail overproduction.

Nonmetals, as a group, were valued at $29.5 million—22 percent of the State total in 1956 and an increase of nearly $1.0 million over the $28.7 million value in 1955. Barite, used principally as an additive to oil well drilling mud; and construction materials, principally stone, sand and gravel, cement, and lime, dominated these advances due to the need for these basic materials for increased oil well drilling, building, highway, and water resource developments within the State and in adjacent States. Consumption of lime produced from Arkansas limestone, for the aluminum, chemical, and construction industries, increased. Although byproduct sulfur decreased slightly in yield—paralleling the decline in extracted natural-gas liquids from natural gas—it increased in value.

Production value of metallic ores (bauxite, manganese, and iron) was $15.5 million (11 percent of the State's total) in 1956; this was a decrease of $294,000 from 1955. Production trends indicated a decrease for bauxite and an increase for manganese. Iron-ore mining was resumed during the year.

[1] Chief, Division of Mineral Industries, Region IV, Bureau of Mines, Bartlesville, Okla.



Digitized by Google

**TABLE 1.—Mineral production in Arkansas, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Abrasive stone (whetstones) | | | 35 | $10,500 |
| Barite | 462,986 | $3,755,094 | 486,254 | 4,255,982 |
| Bauxite long tons, dried equivalent | 1,721,243 | 14,026,190 | 1,668,432 | 13,307,341 |
| Clays | 738,637 | 2,375,882 | 719,251 | 1,636,312 |
| Coal | 577,726 | 4,319,146 | 590,091 | 4,601,264 |
| Gem stones | | 4,000 | | 25,000 |
| Manganese ore (35 percent or more Mn) gross weight | 23,744 | 1,727,286 | 29,485 | 2,066,116 |
| Natural gas million cubic feet | 32,123 | 1,799,000 | 30,162 | 1,810,000 |
| Natural-gas liquids: | | | | |
| Natural gasoline and cycle products thousand gallons | 47,483 | 3,239,000 | 41,529 | 2,541,000 |
| LP-gases do | 57,088 | 2,169,000 | 56,146 | 2,293,000 |
| Petroleum (crude) thousand 42-gallon barrels | 28,369 | 76,880,000 | 29,355 | 78,965,000 |
| Sand and gravel | 9,003,162 | 7,662,942 | 10,199,515 | 8,729,402 |
| Stone | 6,176,313 | 8,025,634 | 6,324,819 | 8,112,989 |
| Value of items that cannot be disclosed: Abrasive stone, portland cement, gypsum, iron ore (1956), lime, slate, soapstone, masonry cement, and recovered elemental sulfur | | 7,615,676 | | 8,181,765 |
| Total Arkansas [2] | | 132,822,000 | | 135,210,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Value has been adjusted to eliminate duplicating the value of clays and stone.

**TABLE 2.—Average unit value of mineral commodities produced in Arkansas, 1952–56**

| Commodity | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Abrasive stone short ton | $180.94 | $109.70 | $301.54 | $269.01 | $245.57 |
| Barite (crude) do | 9.25 | 10.36 | 9.41 | 8.11 | 8.75 |
| Bauxite (long tons, dried equivalent)[1] | 6.38 | 8.48 | 8.20 | 8.15 | 7.98 |
| Cement: | | | | | |
| Portland 376-pound barrel | 2.44 | 2.58 | 2.61 | 2.73 | 2.89 |
| Masonry do | | | | 3.70 | 3.68 |
| Clays: | | | | | |
| Fire clay short ton | 3.46 | 4.60 | 4.99 | 2.61 | 4.33 |
| Kaolin do | (2) | (2) | 10.00 | 10.00 | 10.00 |
| Miscellaneous clay do | 1.06 | 1.06 | 2.18 | 1.36 | 1.00 |
| Coal do | 7.83 | 7.93 | 7.52 | 7.48 | 7.80 |
| Gypsum do | 2.75 | 3.27 | 3.27 | 2.89 | 2.89 |
| Manganese ore (35 percent or more) do | (2) | 86.01 | 74.36 | 72.75 | 70.07 |
| Natural gas thousand cubic feet | .041 | .053 | .055 | .056 | .060 |
| Natural-gas liquids: | | | | | |
| Natural gas and cycle products gallon | .074 | .071 | .064 | .068 | .061 |
| LP-gases do | .042 | .046 | .043 | .038 | .041 |
| Petroleum (crude) 42-gallon barrel | 2.46 | 2.60 | 2.73 | 2.71 | 2.69 |
| Sand and gravel short ton | .99 | 1.01 | .99 | .85 | .86 |
| Slate do | (2) | 9.15 | 9.06 | 9.07 | 9.25 |
| Stone: | | | | | |
| Crushed limestone do | 1.17 | 1.71 | 1.34 | 1.08 | 1.16 |
| Crushed sandstone do | (2) | 1.17 | 2.77 | 2.06 | 1.70 |
| Dimension sandstone do | 4.07 | (2) | | 15.42 | 12.36 |
| Crushed granite do | | | .99 | 1.00 | 1.33 |
| Marble do | 45.45 | 27.22 | 50.18 | | |
| Miscellaneous stone do | 1.07 | 1.25 | 1.26 | 1.39 | 1.10 |
| Soapstone do | (2) | 2.47 | 2.68 | 4.00 | 4.00 |
| Sulfur, recovered elemental do | (2) | 23.08 | 26.75 | 26.49 | 29.34 |

[1] Value of production.
[2] Data not available.

Digitized by Google

## EMPLOYMENT AND INJURIES

**Employment.**—Average annual employment in the mineral industries increased 3 percent over 1955. Metal-mining employment declined 5 percent, while nonmetal employment gained 3 percent. Coal-mining employment increased 5 percent but was 35 percent lower than in 1953. Employment in the crude-petroleum and natural-gas industries gained 5 percent over 1955 and comprised nearly half of the total mining employment.

**Injuries.**—No fatal accidents occurred in coal mines, but one fatal accident occurred in metal and nonmetal mines. Injury data on the petroleum industry were not available.

**Wages.**—The average weekly wage in the metal-mining industry was $84.42—a decrease of 2 percent; in the nonmetals industry $70.54—a gain of 1 percent; in the coal industry $78.19—an increase of 12 percent; and in the crude-petroleum industry $83.76—an increase of 4 percent from 1955.

**TABLE 3.—Average annual employment in mining industries, 1953–56** [1]

| Industry | 1953 [2] Employment | 1954 Employment | 1955 | | 1956 | |
|---|---|---|---|---|---|---|
| | | | Employing units | Employment | Employing units | Employment |
| Metal mining | 920 | 905 | 47 | 910 | 45 | 868 |
| Bituminous-coal mining | 860 | 464 | 39 | 536 | 37 | 561 |
| Crude petroleum and natural gas | 2,940 | 2,967 | 296 | 2,909 | 305 | 3,061 |
| Nonmetallic mining and quarrying | 1,920 | 1,845 | 90 | 2,089 | 99 | 2,159 |
| Total | 6,640 | 6,181 | 472 | 6,444 | 486 | 6,649 |

[1] Arkansas Department of Labor, Employment Security Division, Little Rock, Ark.
[2] Revised figures.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Coal.**—Production of coal in Arkansas totaled 590,000 short tons, increasing for the second year after a 4-year downward trend. Of the 22 mines operated, 15 were underground and 7 open-pit operations. Production was 43 percent from strip mines and 57 percent from underground mines. Coal-producing counties, in the order of importance, were: Sebastian, Johnson, Logan, and Franklin.

**TABLE 4.—Coal production, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Total | Average per ton |
| 1947–51 (average) | 1,354,084 | $10,091,644 | $7.45 | 1954 | 477,268 | $3,589,217 | $7.52 |
| 1952 | 873,088 | 6,839,113 | 7.83 | 1955 | 577,726 | 4,319,146 | 7.48 |
| 1953 | 775,207 | 6,143,757 | 7.93 | 1956 | 590,091 | 4,601,264 | 7.80 |

Digitized by Google

**Petroleum and Natural-Gas Exploration and Development.**—Arkansas experienced an active year in 1956, as the petroleum industry completed 1,002 wells of all types, compared with 786 wells in 1955 and 617 wells in 1954. Despite this added effort reserves continued to decline. The proved reserve of petroleum decreased 4 percent and of natural-gas liquids decreased 6 percent; the natural-gas reserve gained only 0.6 percent during the year. Dry natural gas from relatively shallow sands of Pennsylvanian age was produced in northern Arkansas. Only 19 wells (which resulted in the discovery of 2 gas fields), were drilled in 1956 compared with 20 wells in 1955. In south Arkansas the major part of crude-petroleum and gas-condensate production was from Upper and Lower Cretaceous and Jurassic formations at depths of 6,000 to 8,000 feet. All of the increased drilling took place in southern Arkansas, where 983 holes

**TABLE 5.—Oil and gas well drilling in 1956 [1]**

| County | Proved field wells | | | Exploratory wells | | | Total | | | Grand total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Oil | Gas | Dry | Oil | Gas | Dry | Oil | Gas | Dry | |
| Benton | | | | | | 1 | | | 1 | 1 |
| Bradley | | | | | | 1 | | | 1 | 1 |
| Calhoun | | | | | | 1 | | | 1 | 1 |
| Clay | | | | | | 1 | | | 1 | 1 |
| Columbia | 19 | | 6 | | | 12 | 19 | | 18 | 37 |
| Conway | | 1 | | | | | | 1 | | 1 |
| Crawford | | | | | | 1 | | | 1 | 1 |
| Faulkner | | | | | | 1 | | | 1 | 1 |
| Franklin | | 3 | 3 | | 1 | | | 4 | 3 | 7 |
| Grant | | | | | | 1 | | | 1 | 1 |
| Greene | | | | | | 1 | | | 1 | 1 |
| Hempstead | | | | | | 2 | | | 2 | 2 |
| Hot Spring | | | | | | 2 | | | 2 | 2 |
| Lafayette | 23 | | 16 | | | 36 | 23 | | 52 | 75 |
| Little River | | | | | | 1 | | | 1 | 1 |
| Madison | | | 1 | | | 1 | | | 2 | 2 |
| Miller | 40 | 1 | 22 | | | 17 | 40 | 1 | 39 | 80 |
| Nevada | 80 | | 45 | | | 21 | 80 | | 66 | 146 |
| Ouachita | 246 | | 29 | 1 | | 8 | 247 | | 37 | 284 |
| Pope | | 1 | 1 | | 1 | 2 | | 2 | 3 | 5 |
| Pulaski | | | | | | 1 | | | 1 | 1 |
| Sebastian | | 2 | 1 | | | | | 2 | 1 | 3 |
| Union | 264 | 1 | 43 | | 2 | 38 | 264 | 3 | 81 | 348 |
| Total: 1956 | 672 | 9 | 167 | 1 | 4 | 149 | 673 | 13 | 316 | 1,002 |
| 1955 | 447 | 7 | 173 | 2 | 2 | 155 | 449 | 9 | 328 | 786 |

[1] Arkansas Oil and Gas Commission, Arkansas Oil and Gas Statistical Monthly Bulletins: Vol 25, Nos. 1-12, January-December 1956.

**TABLE 6.—Estimated proved reserves of crude oil, natural-gas liquids, and natural gas, 1955–56 [1]**

| | Proved reserves, Dec. 31, 1955 | Changes in proved reserves due to extensions and discoveries in 1956 | Proved reserves, Dec. 31, 1956 (production was deducted) | Change from 1955, percent |
|---|---|---|---|---|
| Crude oil.....thousand barrels.. | 329,539 | 16,036 | 317,726 | −4 |
| Natural-gas liquids [2] do..... | 45,124 | 356 | 42,467 | −6 |
| Natural gas.....million cubic feet.. | 1,164,367 | 41,447 | 1,171,527 | +0.6 |

[1] American Gas Association, and American Petroleum Institute; Proved Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas: Vol. 11, Dec. 31, 1956, pp. 1-23.
[2] Includes condensate, natural gasoline, and LP-gases.

Digitized by Google

were completed. Of the 1,002 current-year completions in the State, 848 were in proved fields, including 672 oil wells, 9 gas wells, and 167 dry holes; of the 154 exploratory tests, 1 produced oil and 4 gas, and 149 were dry. Three dry gas fields were discovered in north Arkansas during the year, and 7 new oil pools in old fields were discovered in south Arkansas.

**Natural Gas.**—The marketed production of natural gas decreased 1 percent to 30,162 million cubic feet valued at $1.8 million in 1956. Of the 12 producing counties, the first 5, in order of productivity, were: Franklin, Lafayette, Columbia, Union, and Sebastian.

**TABLE 7.—Marketed production of natural gas, 1947–51 (average) and 1952–56** [1]

| Year | Million cubic feet | Value | | Year | Million cubic feet | Value | |
|---|---|---|---|---|---|---|---|
| | | Thousand dollars | Per thousand cubic feet | | | Thousand dollars | Per thousand cubic feet |
| 1947–51 (average) | 49,013 | 1,924 | $0.039 | 1954 | 33,471 | 1,841 | $0.055 |
| 1952 | 42,325 | 1,735 | .041 | 1955 | 32,123 | 1,799 | .056 |
| 1953 | 41,510 | 2,200 | .053 | 1956 | 30,162 | 1,810 | .060 |

[1] Comprises gas either sold or consumed by producers including losses in transmission, amounts added to storage, and increases in gas pipelines.

**TABLE 8.—Gross withdrawals and disposition of natural gas, 1952–56**

(Million cubic feet)

| Year | Gross withdrawals [1] | | | Disposition | | |
|---|---|---|---|---|---|---|
| | From gas wells | From oil wells | Total | Marketed production [2] | Repressuring | Vented and wasted [3] |
| 1952 | 40,400 | 27,200 | 67,600 | 42,325 | 22,070 | 3,205 |
| 1953 | 38,100 | 27,000 | 65,100 | 41,510 | 20,003 | 3,587 |
| 1954 | 36,000 | 20,000 | 56,000 | 33,471 | 18,568 | 3,961 |
| 1955 | 19,000 | 36,000 | 55,000 | 32,123 | 16,649 | 6,228 |
| 1956 | 16,000 | 37,000 | [4] 53,000 | 30,162 | [4] 16,269 | [4] 6,569 |

[1] Marketed production plus quantities used in repressuring, vented, and wasted.
[2] Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
[3] Includes direct waste on producing properties and residue blown to air.
[4] Arkansas Oil and Gas Commission, Arkansas Oil and Gas Statistical Bulletins: Vol. 25, Nos. 1-12, January–December 1956.

**Natural-Gas Liquids.**—Production of natural-gas liquids in Arkansas (97.7 million gallons with a value of $4.8 million) was 7 percent less in quantity and 11 percent less in value than in 1955. Of the total gallons, 42.5 percent was natural gasoline and cycle products, and 57.5 percent was LP-gases. The five producing counties, in order of their importance, were: Columbia, Lafayette, Union, Miller, and Hempstead. In 1956 Arkansas ranked eighth in the United States in the production of natural-gas liquids.

Digitized by Google

**TABLE 9.—Natural-gas liquids produced, 1947–51 (average) and 1952–56**

| Year | Natural gasoline and cycle products | | LP-gases | | Total | |
|---|---|---|---|---|---|---|
| | Quantity (thousand gallons) | Value (thousand dollars) | Quantity (thousand gallons) | Value (thousand dollars) | Quantity (thousand gallons) | Value (thousand dollars) |
| 1947–51 (average) | 58, 390 | 4, 273 | 37, 864 | 1, 517 | 96, 254 | 5, 792 |
| 1952 | 61, 752 | 4, 560 | 49, 128 | 2, 079 | 110, 880 | 6, 639 |
| 1953 | 58, 422 | 4, 123 | 55, 188 | 2, 562 | 113, 610 | 6, 685 |
| 1954 | 50, 776 | 3, 534 | 58, 506 | 2, 221 | 109, 284 | 5, 755 |
| 1955 | 47, 483 | 3, 139 | 57, 188 | 2, 169 | 104, 671 | 5, 408 |
| 1956 | 41, 525 | 2, 541 | 56, 146 | 2, 293 | 97, 675 | 4, 834 |

**Petroleum.**—Petroleum produced in Arkansas in 1956 was 29.4 million barrels valued at $79 million—an increase of 3 percent in quantity and 3 percent in value compared with 1955. Petroleum was the leading mineral resource of Arkansas, and in 1956 the State ranked 11th in value of this fuel. Production was reported from eight counties, in the following order of importance: Union, Columbia, Ouachita, Lafayette, Miller, Nevada, Calhoun, and Bradley. Bradley County joined the ranks of petroleum producers for the first time.

Arkansas continued to hold its own as an important refining area. Over 86 percent of the crude petroleum produced was refined in the State. Runs to stills in 1956 amounted to 25.7 million barrels—an increase of 3 percent over 1955.

The Bureau of Mines, in cooperation with the Arkansas Oil and Gas Commission, investigated the potentialities of the Buckrange reservoir, Stephens oilfield, in Columbia, Nevada, and Ouachita Counties, Ark. The resulting report describes the production history and geology of the Buckrange reservoir; gives pertinent reservoir data;

**TABLE 10.—Production of crude petroleum, 1947–51 (average) and 1952–56**

| Year | Thousand barrels | Value | | Year | Thousand barrels | Value | |
|---|---|---|---|---|---|---|---|
| | | Total (thousand dollars) | Average per barrel | | | Total (thousand dollars) | Average per barrel |
| 1947–51 (average) | 30, 504 | 71, 572 | $2. 35 | 1954 | 29, 130 | 79, 520 | $2. 73 |
| 1952 | 29, 440 | 72, 420 | 2. 46 | 1955 | 28, 369 | 76, 880 | 2. 71 |
| 1953 | 29, 681 | 77, 170 | 2. 60 | 1956 | 29, 355 | 78, 965 | 2. 69 |

Digitized by Google

and presents waterflood performance calculations, indicating that a maximum of 287 barrels of flood oil per acre-foot may be recovered by an efficient flood.[2]

**TABLE 11.—Production of crude petroleum, 1952–56, by fields**

(Thousand barrels)

| Field | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Atlanta | 810 | 649 | 554 | 483 | 438 |
| Bradley West | | | | | 499 |
| Buckner | 722 | 645 | 529 | 478 | 444 |
| Dorcheat-Macedonia | 877 | 841 | 624 | 617 | 632 |
| El Dorado | 649 | 711 | 838 | 857 | 923 |
| Fouke | 1,053 | 1,429 | 1,210 | 1,241 | 1,431 |
| Horsehead | 29 | 194 | 706 | 816 | 403 |
| Magnolia | 4,223 | 4,029 | 3,289 | 2,890 | 3,609 |
| McKamie | 1,446 | 1,369 | 1,480 | 1,331 | 1,349 |
| Midway | 2,674 | 2,642 | 2,262 | 2,048 | 2,238 |
| Shuler | 2,377 | 2,318 | 2,599 | 2,593 | 2,353 |
| Smackover | 3,814 | 3,892 | 4,370 | 4,678 | 4,466 |
| Stephens | 1,308 | 1,223 | 1,077 | 1,014 | 1,157 |
| Village | 1,018 | 840 | 850 | 846 | 811 |
| Wesson | 3,510 | 3,296 | 2,699 | 1,840 | 1,591 |
| Other fields [1] | 4,930 | 5,603 | 6,043 | 6,637 | 7,011 |
| Total Arkansas | 29,440 | 29,681 | 29,130 | 28,369 | 29,355 |

[1] Includes oil consumed on leases and net change in stocks held on leases for entire State.

**TABLE 12.—Indicated demand, production, and stocks of crude petroleum in 1956, by months**

(Thousand barrels)

| Month | Demand | Production | Stocks (end of month) | Month | Demand | Production | Stocks (end of month) |
|---|---|---|---|---|---|---|---|
| January | 2,396 | 2,356 | 2,183 | September | 2,296 | 2,394 | 2,849 |
| February | 2,165 | 2,229 | 2,247 | October | 2,124 | 2,468 | 3,193 |
| March | 1,867 | 2,401 | 2,781 | November | 2,620 | 2,508 | 3,081 |
| April | 1,944 | 2,379 | 3,216 | December | 2,430 | 2,763 | 3,204 |
| May | 2,797 | 2,478 | 2,897 | | | | |
| June | 2,432 | 2,382 | 2,847 | Total: 1956 | 28,164 | 29,355 | |
| July | 2,723 | 2,502 | 2,626 | 1955 | 28,987 | 28,369 | |
| August | 2,370 | 2,495 | 2,751 | | | | |

**Pipeline.**—Oklahoma Mississippi River Products Line, Inc., completed a 22-mile, 6-inch products line from Conway, Ark., to Little Rock Air Force Base.[3]

[2] Meadows, Paul, and Hawkins, Murphy E., Secondary-Recovery Potentialities of the Buckrange Reservoir, Stephens Oilfield, Columbia, Nevada, and Ouachita Counties, Ark.: Bureau of Mines, Rept. of Investigations 5211, 1956, 40 pp.

[3] Oil and Gas Journal, vol. 55, No. 1, Jan. 7, 1957, p. 79.

Digitized by Google

**TABLE 13.—Capacity of petroleum refineries and cracking plants, January 1, 1957**

(Barrels per day)

| Company | Location | Type of plant | Crude-oil capacity | | Cracked-gasoline capacity | |
|---|---|---|---|---|---|---|
| | | | Operating | Building | Operating | Building |
| American Oil Co. | El Dorado | Complete | 38,400 | | 14,930 | 5,000 |
| Berry Asphalt Co. | Stephens | Skimming and asphalt | 2,000 | | | |
| Do. | Waterloo | Skimming, lube, and asphalt | 1,500 | | | |
| Henry H. Cross Co. | Smackover | do | 6,000 | | | |
| Lion Oil Co., Division of Monsanto Chemical Co. | El Dorado | Complete | 28,000 | | 5,500 | |
| Macmillan Petroleum Corp. | Norphlet | Skimming, lubing, and asphalt | 4,000 | | | |
| Total | | | 79,900 | | 20,430 | 5,000 |

Digitized by Google

**TABLE 14.—Sales of petroleum products, 1952–56**

(Thousand barrels)

| Product | 1952 | 1953 | 1954 | 1955 | 1956 | Change from 1955, percent |
|---|---|---|---|---|---|---|
| Gasoline [1] | 10,672 | 11,025 | 11,530 | 12,320 | 13,154 | +7 |
| Kerosine | 1,736 | 1,390 | 1,394 | 1,216 | 1,289 | +6 |
| Range oil | 1,051 | 876 | 830 | 674 | 777 | +15 |
| Distillate fuel oil | 2,325 | 2,222 | 2,136 | 2,357 | 2,558 | +9 |
| Residual fuel oil | 1,497 | 1,006 | 415 | 419 | 545 | +30 |

[1] Consumption compiled by American Petroleum Institute.

## METALS

**Aluminum.**—Arkansas again ranked fourth among the States in aluminum output. For the fifth consecutive year the aluminum industry set new records in primary production. By the end of 1956 the continuing program of expansion raised the supply of aluminum to the level of demand. As a result, the industry began to give more attention to new uses for the lightweight metal.

**Bauxite.**—Arkansas production of bauxite declined 3 percent from 1955 to 1.7 million long tons (dried equivalent) valued at $13.3 million. The State continued to be the leading producer of domestic bauxite, with 96 percent of the Nation's production; the remainder was mined in Alabama and Georgia. Domestic mines accounted for 24 percent of the total new bauxite supply.

Bauxite was used in a new alkylation-effluent treating process by the petroleum-refining industry. It was possible to remove 99 percent of acid and all acidic and neutral esters from alkylation-reactor effluent. The new treating process, developed jointly by D–X Sunray Oil Co. and M. W. Kellogg Co., used bauxite to absorb the troublesome byproducts of sulfuric acid alkylation. The first unit successfully reduced corrosion and fouling in alkylate fractionating equipment and improved lead susceptibility in motor alkylate by effective removal of sulfur. The 98- to 99-percent efficiency of this process compares with 65-percent removal of sulfur obtained in the conventional caustic wash system.[4]

**TABLE 15.—Mine production of bauxite and shipments from mines and processing plants to consumer, 1947–51 (average) and 1952–56, in long tons**

| Year | Mine production | | | Shipments from mines and processing plants to consumers | | |
|---|---|---|---|---|---|---|
| | Crude | Dried-bauxite equivalent | Value | As shipped | Dried-bauxite equivalent | Value |
| 1947–51 (average) | 1,602,362 | 1,353,287 | $8,221,653 | 1,370,068 | 1,270,052 | $9,362,201 |
| 1952 | 1,903,101 | 1,603,833 | 10,235,254 | 2,067,241 | 1,849,287 | 14,084,274 |
| 1953 | 1,802,797 | 1,529,976 | 12,975,902 | 1,889,206 | 1,689,207 | 15,042,236 |
| 1954 | 2,296,528 | 1,949,368 | 15,993,887 | 1,978,216 | 1,711,386 | 15,239,244 |
| 1955 | 2,049,623 | 1,721,243 | 14,026,190 | 1,938,811 | 1,660,263 | 14,844,798 |
| 1956 | 1,966,320 | 1,668,432 | 13,307,341 | 1,827,832 | 1,576,028 | 13,724,443 |

[4] Oil and Gas Journal, vol. 55, No. 12, Mar. 25 1957, p. 162



Digitized by Google

**Iron Ore.**—Three companies mined iron ore in 1956 in Baxter, Fulton, and Randolph Counties.

**Manganese.**—Manganese mining in Arkansas continued to increase; a new record was obtained—29,485 short tons of ore, which had a metal content of 12,525 short tons valued at $2.1 million—a gain of 24 percent in quantity, 7 percent in manganese content, and 20 percent in value over 1955. Of the 10 producers, 9 were in Independence County and 1 in Polk County.

The quota for the Government carlot purchase program for Metallurgical-grade manganese ore was increased, effective June 30, 1958, from 19 million to 28 million long-ton units of contained manganese, and the terminal date was advanced to January 1, 1961.

Exploration by mining companies was extending the manganese producing district in Independence County to the east, west, and north. The Minerva Oil Co. used a churn drill to explore manganiferous limestone in Independence County.

**TABLE 16.—Manganese ores shipped from mines, 1947–51 (average) and 1952–56, in short tons**

| Year | Manganese ore [1] | | Value | |
|---|---|---|---|---|
| | Gross weight | Mn content | Total | Average per ton |
| 1947–51 (average) | 1,769 | 743 | (2) | |
| 1952 | 2,246 | 1,007 | (2) | |
| 1953 | 6,123 | 2,812 | $526,647 | $86.01 |
| 1954 | 13,728 | 5,407 | 1,020,752 | 74.36 |
| 1955 | 23,744 | 11,685 | 1,727,286 | 72.75 |
| 1956 | 29,485 | 12,525 | 2,066,116 | 70.07 |

[1] Containing 35 percent or more manganese (natural).
[2] Data not available.

The Federal Bureau of Mines continued to sample, map, and correlate the data on manganese-ore deposits and manganiferous limestone in Arkansas and to obtain samples for mineral-dressing tests. Deposits of manganiferous limestone, estimated at 140 million tons, with an average manganese content of 5 percent, constitute the largest reserve of manganese in the Batesville district. As a result of mineral-dressing research on a group of Arkansas manganiferous limestones, a beneficiation process was developed that permitted recovery of ferrograde concentrates from four samples. Two other samples were quite unresponsive, and research on another is still under way.[5]

## NONMETALS

**Abrasive Stone.**—Oilstones and whetstones produced in Arkansas increased 4 percent in quantity and decreased 5 percent in value during the year.

**Barite.**—Arkansas producers shipped 486,000 tons of barite in 1956, a new record. Barite ore containing approximately 50 percent barium sulfate ($BaSO_4$), was mined both by open-pit and underground

[5] Fine, M. M., and Frommer, D. W., A Mineral-Dressing Study of Manganese Deposits of West Central Arkansas: Bureau of Mines Rept. of Investigations 5262, 1956, 21 pp.
Fine, M. M., A Mineral-Dressing Study of Manganese Deposits of the Batesville, Ark., District: Bureau of Mines Rept. of Investigations 5301, 1957, 12 pp.

Digitized by Google

methods. The ore must be finely ground for flotation recovery. The ground barite was used mostly by the oil-well-drilling industry. As more oil wells were being drilled deeper, barite requirements for oil-well drilling also increased. Approximately 90 percent of the barite used in drilling muds goes to Louisiana and Texas Gulf coast.

Both world and domestic markets increased during the year.

**TABLE 17.—Primary barite sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Total | Average per ton |
| 1947–51 (average) | 370,424 | $3,010,302 | $8.13 | 1954 | 370,621 | $3,488,483 | $9.41 |
| 1952 | 428,522 | 3,963,828 | 9.25 | 1955 | 462,986 | 3,755,094 | 8.11 |
| 1953 | 380,763 | 3,945,583 | 10.36 | 1956 | 486,254 | 4,255,982 | 8.75 |

**Cement.**—Portland-cement shipments during the year decreased slightly from the Ideal Cement Co. plant near Okay in Howard County. Masonry-cement shipments showed a gain.

A contract was awarded in October 1956 by Ideal Cement Co. for improving existing facilities. The cost of improvements under contract was an estimated $1 million. Production after modernization will be 1,750,000 barrels annually.[6]

**Clays.**—The production of all types of clay in Arkansas was 719,251 short tons valued at $1.6 million—a decrease of 3 percent in quantity and 31 percent in value from 1955. The decrease in value resulted from a lower value assigned to clays used by a principal captive producer. The major uses of clays remained unchanged during the past several years.

According to the Arkansas Business Bulletin, published by the University of Arkansas, the production of unglazed brick in Arkansas rose from 107 million in 1952 to 170 million in 1956—an increase of 59 percent.

Roscolite Co., Fort Smith, completed enlargement of its facilities to increase the production of presized, expanded-shale aggregate for

**TABLE 18.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds**

| Year | Miscellaneous clay | | Fire clay | | Total clay | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 186,640 | $185,424 | 271,202 | $870,164 | 457,842 | $1,005,588 |
| 1952 | 166,465 | 176,392 | 386,111 | 1,337,542 | 552,576 | 1,513,934 |
| 1953 | 197,874 | 209,549 | 331,252 | 1,524,865 | 529,126 | 1,734,414 |
| 1954 | [1] 254,490 | [1] 555,891 | 362,960 | 2,000,476 | 617,450 | 2,556,367 |
| 1955 | [2] | [2] | [2] | [2] | 738,637 | 2,375,882 |
| 1956 | [1] 444,553 | [1] 447,469 | 274,698 | 1,188,843 | 719,251 | 1,636,312 |

[1] Kaolin and clay used for cement combined with miscellaneous clay to avoid disclosing individual company confidential data.
[2] Quantity and value included in total clay.

[6] Ideal Cement Co. 1956 Annual Report, P. 16.

Digitized by Google

manufacturing structural concrete and other concrete products. Installation of a new rotary kiln increased production 75 percent. Provision was made for additional capacity later.[7]

**Gem Stones.**—*Diamonds.*—Gem collectors were permitted to search in the "Crater of Diamonds," Murfreesboro, Ark., for 8 hours for a fee of $1.50 and could keep diamonds up to 5 carats in weight. Diamonds above 5 carats were appraised, and an additional fee was paid to the mine owner.

A gem collector found a 15.31-carat diamond that had an estimated value of $15,000 in March 1956 at the "Crater of Diamonds." The stone was the largest ever found on the North American Continent by an individual. A larger diamond was found at the "Crater of Diamonds" during mining operations. The site is part of a 72-acre tract which once boasted the only diamond-mining operation in North America. The first diamond was discovered there in 1906, but mining operations have been erratic and were suspended in 1930. Although production figures are incomplete, it has been estimated that the area produced 48,000 stones, with an average weight of one-fourth carat. About 10 percent of the stones were reported to be of gem quality; the rest were used for industrial purposes.

**Gypsum.**—Gypsum production, all from Pike County, Ark., increased 5 percent in quantity and value over 1955.

**Lime.**—Lime production increased 4 percent in quantity and 3 percent in value during the year. Lime was used by the aluminum industry of the State, and by the paper, petroleum, sugar-refining, and other industries. Lime also was used for water purification.

**Perlite.**—No crude perlite was mined in Arkansas; however, perlite was expanded and used for aggregate by the construction industry.

**Phosphate Rock.**—No phosphate rock was mined in Arkansas in 1956. The Bureau of Mines conducted a reconnaissance of the phosphate deposits in Arkansas, Kansas, Oklahoma, and Texas; samples of 33 deposits of phosphatic shales were collected and analyzed.[8]

**Sand and Gravel.**—Sand and gravel was produced in 43 of the State's 75 counties; in order of value, the leading counties were: Pulaski, Miller, Izard, Hot Spring, and Little River. Production of sand and gravel amounted to 10.2 million short tons valued at $8.7 million. This gain of 13 percent in quantity and 14 percent in value over 1955 was attributed to highway and building-construction programs.

**Slate.**—Slate production in Arkansas increased in quantity and value over the previous year.

**Soapstone.**—Output and value of soapstone decreased during 1956.

**Stone.**—Production and sale of stone continued an upward trend for the fifth successive year and attained a record high of 6.3 million short tons valued at $8.1 million. Crushed granite was quarried and used for concrete and road metal. Crushed sandstone used for concrete and road metal was 54 percent; for manufacture of refractories, 44 percent; and as riprap, 2 percent. Over 98 percent of the dimension sandstone was dressed and used for construction; the remainder

[7] Pit and Quarry, vol. 48, No. 9, March 1956, p. 66.
[8] Ryan, J. P., Reconnaissance of Phosphate-Rock Deposits in Arkansas, Kansas, Oklahoma, and Texas: Bureau of Mines Rept. of Investigations 5222, 1956, 8 pp.

Digitized by Google

**TABLE 19.—Sand and gravel sold or used by producers, 1955–56, by class of operations and uses**

| | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 1,157,483 | $811,942 | $0.70 | 1,398,942 | $1,122,097 | $0.80 |
| Paving | 1,295,244 | 906,394 | .70 | 1,205,435 | 881,866 | .73 |
| Gravel: | | | | | | |
| Building | 983,226 | 880,440 | .90 | 1,453,913 | 1,507,585 | 1.04 |
| Paving | 2,873,730 | 2,535,240 | .88 | 2,575,178 | 2,308,671 | .90 |
| Other | 144,915 | 170,347 | 1.18 | 193,875 | 196,880 | 1.02 |
| Undistributed | [1] 275,655 | 575,050 | 2.09 | [2] 385,695 | 716,380 | 1.86 |
| Total commercial sand and gravel | 6,730,253 | 5,879,413 | .87 | 7,213,038 | 6,733,479 | .93 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Paving | 178,462 | 156,918 | .88 | | | |
| Building | | | | 53,151 | 10,630 | .20 |
| Gravel: | | | | | | |
| Paving | 2,034,804 | 1,613,817 | .79 | 2,709,326 | 1,865,293 | .69 |
| Building | 59,643 | 12,794 | .21 | 224,000 | 120,000 | .54 |
| Total Government-and-contractor sand and gravel | 2,272,909 | 1,783,529 | .78 | 2,986,477 | 1,995,923 | .67 |
| Grand total | 9,003,162 | 7,662,942 | .85 | 10,199,515 | 8,729,402 | .86 |

[1] Includes glass, molding, engine and other sands, and railroad-ballast gravel; Bureau of Mines not at liberty to publish separately.
[2] Includes glass, molding, filter and other sands, and railroad-ballast sand and gravel; Bureau of Mines not at liberty to publish separately.

was utilized for rough construction. Crushed limestone used in manufacturing cement was 19 percent, for manufacturing lime 17 percent, for metallurgical flux 17 percent, for construction and road metal 42 percent, and as agricultural limestone 4 percent; the remainder was used for railroad ballast. Limestone used as a soil conditioner increased 9 percent to 105,000 short tons during the year. Miscellaneous stone used for concrete and road metal was 67 percent, for railroad ballast 26 percent, and for riprap 7 percent.

**TABLE 20.—Stone sold and used by producers, 1952–56**

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Total | Average per ton |
| 1952 | [1] 2,967,479 | [1] $3,346,201 | $1.13 | 1955 | 6,176,313 | $8,025,634 | $1.30 |
| 1953 | 3,545,350 | 5,069,750 | 1.43 | 1956 | 6,324,819 | 8,112,989 | 1.28 |
| 1954 | 4,604,067 | 5,929,638 | 1.29 | | | | |

[1] Incomplete figure; excludes dimension miscellaneous stone.

**Sulfur (Recovered Elemental).**—Recovery of byproduct sulfur from gas cycle plants continued with only a slight decrease in quantity and a 9-percent increase in value from 1955. All of the recovered

Digitized by Google

elemental sulfur was produced at plants in Columbia and Lafayette Counties.

**Talc.**—Mineral-dressing investigations were conducted in the laboratory on talc-bearing samples from Arkansas and Texas under the Federal Bureau of Mines program for examinations and surveys.[9] This program is concerned, in part, with improvement, conservation, and utilization of the domestic mineral resources. Two soapstone samples were successfully upgraded by flotation. The process could enable the producers to meet more rigid specifications of higher priced talc commodities.

## REVIEW BY COUNTIES

Mineral production was reported in 59 of the 75 counties in Arkansas (54 counties in 1955). Fourteen of these counties reported production of over $1 million. Petroleum was produced in 8 counties (7 in 1955); natural gas in 12; natural-gas liquids in 5; clay in 11 (12 in 1955); coal in 4; sand and gravel in 43 (45 in 1955); stone in 18 (12 in 1955); bauxite, sulfur, slate, lime, and manganese in 2; and gypsum, abrasive stone, barite, cement, and soapstone each in 1 county.

**Ashley.**—Sand and gravel for structural and paving purposes was produced by S. C. Chadwick. St. Francis Materials Co. produced structural sand and gravel at a stationary plant.

**Baxter.**—Oresco, Inc., started an iron mine at Mountain Home during the year. C. E. Sharp produced structural sand.

**Benton.**—Paul Davis produced gravel. Benton County Highway Department produced paving gravel. Independent Gravel Co. quarried and crushed limestone for use as a soil conditioner. One dry exploratory well was drilled.

**Bradley.**—Carter Lyon produced paving gravel. Earl Reynolds produced structural sand and gravel. Petroleum also was produced in Bradley County. One dry exploratory well was completed.

**Calhoun.**—W. W. Grant produced structural sand and gravel. Ouachita Aggregate Co. operated a fixed plant to produce structural sand and gravel and paving gravel. Pine Bluff Sand & Gravel Co. produced structural sand and gravel and railroad-ballast sand. St. Francis Materials Co. produced structural and paving sand and gravel at its fixed plant. Petroleum also was produced in the county. One dry exploratory well was completed.

**Carrol.**—Mrs. John Garrett produced some pit-run gravel at Kings River near Berryville.

**Chicot.**—Greenville Gravel & Dredging Co. produced structural and paving sand and gravel.

**Clark.**—Hope Brick Works mined miscellaneous clay for manufacturing heavy clay products. Arkadelphia Sand & Gravel Co. produced molding, paving, and other sand and structural, paving, and other gravel. R. and P. Barringer produced paving gravel at their fixed plant. W. R. Britt produced structural sand and gravel. Austin F. Freeman operated a fixed plant to produce paving gravel. Chas. McMillan produced building and paving gravel. Arlington

[9] Frommer, D. W., and Fine, M. M., Laboratory Flotation of Talc From Arkansas and Texas Sources: Bureau of Mines Rept. of Investigations 5241, 1956, 5 pp.

Digitized by Google

Waggoner operated a portable plant and produced paving sand and gravel. West Lake Quarry & Materials Co. quarried and crushed limestone for concrete and road stone.

**TABLE 21.—Value of mineral production in Arkansas, 1955–56, by counties[1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Ashley | (2) | (2) | Sand and gravel. |
| Baxter | | (2) | Iron ore, sand and gravel. |
| Benton | $150,202 | $52,903 | Stone, sand and gravel. |
| Bradley | (2) | 50,873 | Sand and gravel, petroleum. |
| Calhoun | 938,534 | 525,816 | Do. |
| Carroll | (2) | 972 | Gravel. |
| Chicot | (2) | (2) | Sand and gravel. |
| Clark | 51,983 | 321,397 | Stone, sand and gravel, clays. |
| Clay | 166,449 | 28,263 | Sand and gravel. |
| Columbia | 21,656,951 | 21,827,491 | Petroleum, natural-gas liquids, natural gas, sulfur. |
| Conway | (2) | | |
| Craighead | 37,747 | 20,338 | Sand and gravel, clays. |
| Crawford | 29,669 | 29,879 | Natural gas. |
| Crittenden | (2) | (2) | Sand and gravel. |
| Cross | 142,566 | 321,209 | Do. |
| Desha | 57,401 | 116,864 | Do. |
| Drew | (2) | (2) | Do. |
| Franklin | 585,954 | 699,264 | Natural gas, coal, stone. |
| Fulton | | 15,858 | Iron ore. |
| Garland | 53,932 | 90,570 | Sand and gravel, grindstones, gem stones. |
| Grant | (2) | (2) | Sand and gravel. |
| Greene | 372,229 | 230,363 | Do. |
| Hempstead | 248,538 | 271,352 | Natural-gas liquids, sand and gravel, clays. |
| Hot Spring | 5,807,661 | 5,814,046 | Barite, clays, sand and gravel, stone, gem stones. |
| Howard | (2) | (2) | Cement, sand and gravel. |
| Independence | 2,633,040 | 3,047,340 | Manganese, lime, stone, sand and gravel. |
| Izard | 1,066,332 | 1,261,368 | Stone, sand and gravel. |
| Jackson | (2) | (2) | Sand and gravel. |
| Jefferson | (2) | (2) | Sand and gravel, stone. |
| Johnson | 2,239,040 | 2,016,025 | Coal, clays, natural gas, stone. |
| Lafayette | 14,985,053 | 15,274,565 | Petroleum, sulfur, natural-gas liquids, natural gas, sand and gravel. |
| Lawrence | (2) | (2) | Sand and gravel. |
| Lincoln | 31,968 | 73,996 | Do. |
| Little River | (2) | (2) | Sand and gravel, stone. |
| Logan | 485,949 | 437,672 | Stone, coal. |
| Lonoke | | 15,952 | Stone. |
| Madison | (2) | (2) | Do. |
| Marion | 10,645 | (2) | Sand and gravel. |
| Miller | 5,577,588 | 6,924,015 | Petroleum, sand and gravel, natural-gas liquids, clays, natural gas. |
| Mississippi | 100,877 | (2) | Sand and gravel. |
| Montgomery | (2) | (2) | Slate, gem stones. |
| Nevada | 2,967,325 | 3,241,619 | Petroleum, sand and gravel, natural gas. |
| Newton | 46,000 | | |
| Ouachita | 14,834,985 | 15,468,557 | Petroleum, sand and gravel, natural gas, clays. |
| Perry | (2) | (2) | Sand and gravel. |
| Phillips | (2) | (2) | Do. |
| Pike | (2) | (2) | Gypsum, gem stones, sand and gravel. |
| Poinsett | 32,936 | (2) | Sand and gravel. |
| Polk | 24,323 | 122,336 | Manganese, stone, clays. |
| Pope | 149,153 | (2) | Sand and gravel, natural gas, stone. |
| Pulaski | 8,064,544 | 9,322,838 | Stone, sand and gravel, bauxite, clays. |
| Randolph | | 34,196 | Iron ore. |
| St. Francis | 181,547 | (2) | Sand and gravel. |
| Saline | 14,053,992 | 12,076,860 | Bauxite, lime, soapstone, slate, sand and gravel. |
| Sebastian | 2,161,049 | 3,065,611 | Coal, sand and gravel, clays, natural gas, stone. |
| Union | 25,192,074 | 24,069,594 | Petroleum, natural-gas liquids, natural gas, clays. |
| Washington | (2) | (2) | Stone, natural gas, sand and gravel. |
| White | | (2) | Stone. |
| Yell | (2) | | |
| Undistributed | 7,683,764 | 7,807,901 | |
| Total | 132,822,000 | 135,210,000 | |

[1] The following counties are not listed, because no mineral production was reported: Arkansas, Boone, Cleburne, Cleveland, Dallas, Faulkner, Lee, Monroe, Prairie, Scott, Searcy, Sevier, Sharp, Stone, Van Buren, and Woodruff.

[2] Figures withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Digitized by Google

**Clay.**—Claude Bradford produced pit-run gravel. Buckskull Gravel Co. operated a fixed plant and produced paving sand and gravel. D. & W. H. Crockett produced pit-run paving gravel. Jess McKinney produced pit-run building gravel. One dry exploratory well was drilled.

**Columbia.**—The county ranked first in the State in the production of natural-gas liquids, second in crude petroleum, and third in natural gas. Lion Oil Co. recovered sulfur from natural gas by the modified Claus process. Olin Mathieson Chemical Corp. recovered sulfur by the Mathieson process. Columbia County ranked second in the State in total value of minerals produced. Twelve exploratory wells were drilled; all proved dry. Of the 25 field development wells drilled, 19 were oil productive and 6 were dry. Much of the gas obtained in Columbia County contained objectionable hydrogen sulfide.

**Craighead.**—Wheeler Brick Co., Inc., mined red clay for manufacturing face brick at its plant near Jonesboro. Cox Gravel Co. produced structural gravel. R. D. Davenport produced washed gravel for railroad ballast. Mississippi Valley Construction Co. produced washed structural sand and gravel.

**Cross.**—Cross County Gravel Co. produced structural and paving gravel, also a special gravel with a clay binder, which was used for constructing secondary roads. Humphries & Kail produced structural and paving sand and gravel. McGeorge Construction Co. produced structural and paving gravel. The three companies mentioned above operated washing plants.

**Desha.**—Sam Finley, Inc., produced structural sand and gravel. Greenville Gravel & Dredging Co. produced structural and paving sand and gravel. Linwood Smith operated a dredge and produced structural and paving sands and gravels.

**Drew.**—Mrs. R. F. Hyatt, Sr., trustee, operated a portable plant that produced paving gravel. O'Neill Bros. Sand & Gravel Co., Clyde Rogers, and Drew County Highway Department produced structural and paving sand and gravel.

**Franklin.**—The county continued to rank first in the State in the production of natural gas. Coal was produced by the Arnold Coal Co. strip mine and was used chiefly for generating steam. Arnold Stone Co. quarried dimension sandstone for construction and rubble. One exploratory well was completed as a gas producer. Six development wells were drilled; 3 were completed as gas producers, and 3 were dry.

**Fulton.**—Double E Mining Co. developed an iron mine and began to ship brown iron ore.

**Garland.**—Whetstones were produced by R. C. Neighbors from the Neighbors mine, David Helton from the Ketcham mine, and Marcellus Thomas from the South Five mine. Quartz crystals were produced by Charles Coleman near Mountain Valley and by Garland Milholen at Crystal Springs from the Crystal Mountain mine. L. C. Eddy & Son Construction Co. produced paving gravel. Malvern Gravel Co. produced glass sand. Smith Bros. Construction & Materials Co. produced structural sand and gravel at its fixed plant. United States Army Corps of Engineers contracted for paving gravel.

Digitized by Google

**Grant.**—Structural sand and gravel was produced by J. E. Hulse and Willie Keel.

**Greene.**—Structural and paving sand and gravel were produced by Arkansas Gravel Co., B. & S. Gravel Co., Ted Cline, and Mississippi Valley Construction Co. St. Francis Materials, Inc., operated a fixed plant and produced paving sand and gravel. One dry exploratory well was drilled.

**Hempstead.**—Natural-gas liquids were produced. Hope Brick Works mined clay for manufacturing heavy clay products. Paving gravel was produced by the portable plant of R. H. Davis. Two dry exploratory wells were drilled.

**Hot Spring.**—All barite produced in the State in 1956 was from Hot Spring County. Baroid Division of the National Lead Co. and Magnet Cove Barium Corp. were the producers. The county ranked first in the State in the production value of clay, third in stone, and fourth in sand and gravel. Acme Brick Co. and Malvern Brick & Tile Co. mined fire clay for use in refractories and miscellaneous clay for manufacturing heavy clay products. Freshour Bros. produced building and paving sand and gravel. Malvern Gravel Co. operated a fixed plant, producing paving sand and gravel. Crushed sandstone was crushed and used as refractory stone ganister by Harbison-Walker Refractories Co. and Coogan Gravel Co. Quartz crystals were produced by J. P. Bauer from deposits near Hot Springs. Two dry exploratory wells were drilled.

**Howard.**—The only cement-manufacturing plant in Arkansas was owned and operated by the Ideal Cement Co. near Okay, Ark. The company mined chalk, marl, and limestone for use in manufacturing cement. During the year the company signed a contract for work necessary to improve its facilities; the estimated cost of the improvements was about $1 million. Structural and paving sands and gravels were produced by the Mississippi Valley Construction Co. and John Watson.

**Independence.**—Manganese ore shipped by nine producers was the most important mineral commodity in Independence County. Lime for industrial use, chemicals, and building was produced by Batesville White Lime Co. Galloway Sand & Gravel Co. operated a dredge to produce structural sand. Limestone was quarried and crushed by the Batesville White Lime Co. for use in concrete, as roadstone, and as a soil conditioner. Dimension sandstone for rough construction was quarried by Bristow Stone Co. and Salado Stone Co.

**Izard.**—The county continued to rank second in the State in production value of stone and third in sand and gravel. Glass sand was produced by the Silica Products Co., Inc., plant near Guion. Crushed limestone for use as a metallurgical flux and for concrete aggregate, roadstone, soil conditioner, asphalt filler, poultry grit, and lime was produced by the Aluminum Company of America and the Arkansas Limestone Co.

**Jackson.**—Sand and gravel for structural and paving uses was quarried by Allbright Bros. Construction Co. and dredged by Mobley Construction Co., Inc., from deposits near Newport.

**Jefferson.**—Structural sand and gravel was produced by Pine Bluff Sand & Gravel Co. McGeorge Contracting Co. quarried crushed limestone for use as concrete aggregate and roadstone.

Digitized by Google

**Johnson.**—The county ranked second (first in 1955) in coal production during the year. Coal mined in the western part of the county was sold almost exclusively to steel mills because of its coking qualities. Coal from the eastern part of the county was destined chiefly for domestic consumption. Eureka Brick & Tile Co. mined clay for manufacturing heavy clay products. Dimension sandstone was quarried by the Texas Ledge Stone Co. near Lamar for dressed stone and by Clarksville Ledge Stone Co. for use as rubble. Natural gas also was produced.

**Lafayette.**—The county ranked first in the State in the production of byproduct elemental sulfur, second in natural gas and natural-gas liquids, and fourth in the value of total minerals produced and in the production of petroleum. Exploratory drilling for petroleum was disappointing, because 36 dry holes were drilled. Of 39 development wells drilled in 1956, 23 were completed as oil producers, and 16 were dry. Paving and structural sand and gravel were produced by Meriwether Gravel Co., Inc., Lambert & Barr, International Paper Co., and Graves Bros. Construction Co. Olin Mathieson Chemical Corp. recovered elemental sulfur from natural gas by the Mathieson process.

**Lawrence.**—Black Rock Sand & Gravel Co. operated a fixed plant to produce structural sand and gravel and also pea gravel.

**Lincoln.**—Structural and paving sand and gravel were produced by Glover Bros. at their fixed plant and by Willie Keel and Linwood Smith.

**Little River.**—Ark-La Lime Co. quarried, crushed, and ground limestone for use as soil conditioner. Structural and paving sand and gravel were produced by Braswell Sand & Gravel Co. One dry exploratory well was drilled.

**Logan.**—The county continued to rank third in the production of bituminous coal. Two mines used manual methods to mine coal, while 1 mine used machines. Dressed dimension sandstone was quarried by Logan County Building Stone Co. and Schwartz Bros. Sandstone was quarried and used for rubble and rough construction by the Arkansas Ledge Stone Co., Rainbow Stone Co., and Wurst & Vassaur.

**Lonoke.**—Granite was quarried and crushed for use as concrete aggregate and roadstone by the Lonoke County Highway Department.

**Madison.**—Limestone was crushed and used as soil conditioner by War Eagle Lime Co.

**Marion.**—Structural and paving sand and gravel were produced by Freshour Bros.

**Miller.**—The county was the second-ranking producer of sand and gravel, fourth-ranking producer of natural-gas liquids, and fifth-ranking producer of petroleum in the State. Seventeen dry exploratory wells were drilled. Development drilling of 63 wells resulted in 40 oil producers, 1 gas producer, and 22 dry holes. Gifford-Hill & Co., Inc., Graves Bros. Construction Co., General Construction Co., and Lambert & Barr produced sand and gravel for structural, paving, and railroad-ballast uses. W. S. Dickey Clay Manufacturing Co. mined fire and miscellaneous clays for manufacturing heavy clay

Digitized by Google

products at the company plant near Texarkana, Tex. Ark-La Oil Co. operated its natural-gasoline and cycle plant at Rodessa.

**Mississippi.**—Structural and paving sand and gravel were produced by the Mississippi Valley Construction Co. and Elliott Sartain & Co.

**Montgomery.**—Slate was quarried, ground, and crushed to form granules and flour by Bird & Son, Inc., for self use. Quartz crystal was produced by Coy Drain.

**Nevada.**—The county ranked sixth in petroleum production. Twenty-one dry exploratory wells were drilled. Development drilling resulted in 80 oil-productive wells and 45 dry holes. Structural and paving sand and gravel were produced by Graves Bros. Construction Co., Hignight Nursery, and Stevens Bros. Sand & Gravel Co. Natural gas was also produced.

**Ouachita.**—The county ranked third in the State in the value of total minerals produced and third in petroleum produced. Nine exploratory wells were drilled; 1 was completed as an oil producer, and 8 were dry. During the year 275 development wells were drilled, 246 were completed as oil producers, and 29 were dry holes. Structural and paving sand and gravel were produced by B. & G. Dredging & Towing Co., Graves Bros. Construction Co., Floyd Hughes, Pine Bluff Sand & Gravel Co., and Standard Gravel Co. Hope Brick Works mined clay for manufacturing brick and heavy clay products, including structural tile.

**Perry.**—Structural and paving sand and gravel were produced by Reynolds and Williams.

**Phillips.**—Paving sand and gravel was produced by Central State Dredging Co. and Sam Finley, Inc.

**Pike.**—All gypsum mined in Arkansas was from Pike County and was produced by Arkansas Gypsum Co.

Diamonds, with an estimated value of over $19,000, were found by gem collectors in "The Crater of Diamonds," which is operated by Howard A. Millar. Paving sand and gravel was produced by Arkansas Gypsum Co. and Lucille M. Frey.

**Poinsett.**—Pit-run paving gravel was produced by Nelson Crowder and W. G. Newberry.

**Polk.**—After a lapse of several years, Will H. Hargus started mining manganese ore in the county. W. S. Dickey Clay Manufacturing Co. mined shale for manufacturing of heavy clay products. Limestone was quarried and crushed for railroad ballast by Arkhola Sand & Gravel Co.

**Pope.**—Structural and paving sand and gravel were produced by Mobley Construction Co., Inc., and Pope County Highway Department. United States Army Corps of Engineers quarried sandstone for riprap. Three exploratory wells were drilled; 1 was completed as a gas producer, and 2 were dry holes. Two development wells were drilled; 1 was completed as a gas producer, and 1 was dry. Natural gas also was produced.

**Pulaski.**—The county ranked first in the State in the output of sand and gravel, first in stone, and second in high-alumina clays. Significant quantities of bauxite were produced during the year. Bauxite was mined by American Cyanamid Co., Dulin Bauxite

Digitized by Google

Co., and Reynolds Mining Corp. Several calcining, chemical, and activating plants in the county processed bauxite for abrasives, chemicals, and other industrial uses. Big Rock Stone & Material Co. quarried and processed quartzite sandstone and nepheline syenite for use as roofing granules, riprap, concrete aggregate, roadstone, and railroad ballast. Limestone was quarried and crushed for use as concrete aggregate and as roadstone by Ben Hogan, D. F. Jones, Reynolds & Williams, and Fell Vaughn. Sandstone was quarried and crushed for use as concrete and roadstone by United States Army Corps of Engineers. The State of Arkansas Highway Department quarried limestone and sandstone and processes these materials for use as concrete and roadstone. Artificially colored roofing granules were manufactured by the Minnesota Mining & Manufacturing Co. from nepheline syenite produced by Big Rock Stone & Material Co. Consolidated Chemical Industries, Inc., A. P. Green Fire Brick Co., and Dulin Bauxite Co. mined high-alumina bauxitic kaolinitic clay from large residual deposits south and southwest of Little Rock. Sand and gravel was quarried by Big Rock Stone & Material Co., Arkansas State Highway Department, Monroe Machinery Co., John D. Ott, and Horace A. Illing for structural, paving, and bank stabilization uses.

Vermiculite was exfoliated by the Zonolite Co. from crude vermiculite mined outside the State and processed in Arkansas. One dry exploratory well was drilled.

**Randolph.**—An iron mine was developed by A. J. Curry; the property was sold to Ray S. Pointer, who continued production during the year.

**Saline.**—Bauxite mining (85 percent of the Nation's total production) and aluminum production were the most important industries in the county. Bauxite deposits were mined either by open-pit or underground methods by Aluminum Company of America, Dulin Bauxite Co., Norton Co., and Reynolds Mining Corp. Approximately 85 percent of the bauxite was used for producing alumina in 2 large plants in the county. The remainder was processed by calcining and activating and by chemical plants. Lime for chemical and industrial uses was produced by Aluminum Company of America and Reynolds Metals Co. Milwhite Co., Inc., quarried and processed soapstone for use as asphalt filler, insecticide carrier, and roofing material and in manufacturing rubber. Structural and paving sand and gravel were produced by H. W. Ballard, H. L. Green, Mrs. Daisy Nalley, Newcomb & West Construction Co., Mrs. Kenneth Pelton, and Mike Richards Equipment Co. Slate was quarried and ground to produce slate flour by Milwhite Co., Inc. The county ranked fifth in the State in the total value of minerals produced.

**Sebastian.**—The county ranked first in production of coal, most of which was shipped to coking plants at steel mills. Natural gas, clay, sand and gravel, and stone also were produced commercially. Sand and gravel for construction, paving, and fill were dredged and processed by Arkhola Sand & Gravel Co. Acme Brick Co. mined clay for manufacturing brick and heavy clay products. Roscolite Co. mined clay for manufacturing lightweight aggregates. Dimension sandstone was quarried for rough construction by Dixie Stone Co. Limestone was quarried and crushed for concrete aggregate and roadstone

Digitized by Google

by Bob Dills. Of three gas-development wells drilled, 2 were completed as gas producers, and 1 was a dry hole. Athletic Mining & Smelting Co. operated a horizontal-retort zinc smelter at Fort Smith.

**Union.**—Union County ranked first in the State in total mineral production, which was valued at $24 million; it also ranked first in production of petroleum, fourth in natural gas, and third in natural-gas liquids. The county was the oldest and the most prolific gas producer in Arkansas. Exploratory drilling in 1956 resulted in only 2 gas wells and 38 dry holes. Development drilling of 308 wells resulted in 264 oil producers, 1 gas well, and 43 dry holes. Four petroleum refineries and 3 natural-gasoline and cycle plants were operated in the county. El Dorado Brick Works produced common and face bricks from clays mined near El Dorado.

**Washington.**—Stone, natural gas, and sand and gravel were produced commercially in the county. Limestone was quarried and crushed for use as concrete aggregate and roadstone by McClinton Bros. Paul Davis produced fill gravel.

**White.**—Sandstone was quarried and crushed by Acme Materials Co for use in manufacturing high-silica refractories.

Digitized by Google

Digitized by Google

# The Mineral Industry of California

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the California Department of Natural Resources, Division of Mines.

By L. E. Davis [1], G. C. Branner [1], and R. Y. Ashizawa [2]

CALIFORNIA'S mineral production rose in value to a new peak of $1.6 billion dollars in 1956, exceeding the former high of 1955 by $100 million. This advance was not general; but most commodities shared in the increase. Gold, tungsten, natural gas, and natural-gas liquids were notable exceptions.

Owing to a sharp increase in its unit price, the greater value of the petroleum production alone contributed over $32 million of the rise. The quantity of petroleum produced dropped, however, below that in 1955, continuing a downward trend. This was attributed to gradual depletion of California's oil reserves despite intensive exploratory drilling and new production from minor fields. Also reflecting the waning reserves of mineral fuels, the total output of natural gas (of which 73 percent was wet gas), and natural-gas liquids fell below the previous year both in quantity and value, although 4 new dry-gas fields were discovered in 1956. The State's only producing carbon dioxide-gas well became inoperative in October.

The most noteworthy production advances among the nonmetallic minerals and commodities, both in quantity and value, were made by those utilized in the construction industry—cement, sand and gravel, and stone in particular. Gypsum and lime production also rose both in quantity and value. New home construction declined in 1956, but heavy construction activities and building repair and maintenance were sufficient to overshadow this slump. The demand for gypsum, limestone, lime, and industrial sands in other than the construction industry help to swell the outputs of these commodities. The quantity of crude perlite produced, as well as the total yield of pumice, pumicite, and volcanic cinder, dropped but higher unit prices for these materials (used largely in construction) resulted in increased values compared with 1955. The production of asbestos, slate, and mica continued to be minor.

California's salines industry prospered in 1956, and there were production increases, in both quantity and value of all minerals in this class. Value increases of boron minerals, sodium carbonate, salt,

[1] Commodity-industry analyst, Region II, Bureau of Mines, San Francisco, Calif.
[2] Supervisory statistical assistant, Region II, Bureau of Mines, San Francisco, Calif.



Digitized by Google

**TABLE 1.—Mineral production in California, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Boron minerals | 924,496 | $33,816,464 | 944,950 | $39,591,953 |
| Cement ..... 376-pound barrels | 35,087,213 | 103,803,894 | 39,289,586 | 120,511,049 |
| Chromite ..... gross weight | 22,105 | 1,834,277 | 27,082 | 2,191,956 |
| Clays | 2,860,395 | 5,027,381 | 2,981,595 | 6,137,517 |
| Coal (lignite) | 7,650 | 76,500 | 12,000 | 120,000 |
| Copper (recoverable content of ores, etc.) | 613 | 457,298 | 859 | 730,150 |
| Gem stones | [2] | [2] | [2] | 90,000 |
| Gold (recoverable content of ores, etc.) troy ounces | 251,737 | 8,810,795 | 193,816 | 6,783,560 |
| Gypsum (crude) | 1,307,625 | 3,273,724 | 1,399,390 | 3,401,606 |
| Iron ore (usable) ..... long tons, gross weight | 1,776,536 | [3] | 2,414,277 | [3] |
| Lead (recoverable content of ores, etc.) | 8,265 | 2,462,970 | 9,296 | 2,918,944 |
| Lime | 268,009 | 4,372,789 | 302,479 | 5,077,951 |
| Magnesium compounds from sea water and bitterns (partly estimated) MgO equivalent | 58,042 | 3,833,409 | 66,007 | 4,531,777 |
| Manganese ore (35 percent or more Mn)[4] gross weight | 3,136 | 270,519 | 6,595 | 595,001 |
| Mercury ..... 76-pound flasks | 9,875 | 2,867,206 | 9,017 | 2,343,699 |
| Natural gas ..... million cubic feet | 538,178 | 119,476,000 | 504,458 | 113,503,000 |
| Natural-gas liquids: | | | | |
| Natural gasoline and cycle products— thousand gallons | 929,649 | 89,003,000 | 876,902 | 84,615,000 |
| LP-gases ..... do | 360,962 | 19,379,000 | 410,232 | 21,332,000 |
| Peat | [2] | [2] | 18,918 | 214,735 |
| Perlite | 15,653 | 125,113 | 15,119 | 134,861 |
| Petroleum (crude) thousand 42-gallon barrels | 354,812 | 887,030,000 | 350,754 | 918,975,000 |
| Pumice | 797,306 | 1,099,459 | 634,356 | 2,333,809 |
| Salt (common) | 1,314,535 | 6,751,420 | 1,444,211 | 7,605,764 |
| Sand and gravel | 64,878,648 | 66,820,360 | 86,525,955 | 96,776,212 |
| Silver (recoverable content of ores, etc.) troy ounces | 954,181 | 863,582 | 938,139 | 849,063 |
| Stone | 24,708,321 | 37,164,384 | 32,583,370 | 46,108,652 |
| Strontium minerals | 177 | 4,425 | [3] | [3] |
| Sulfur ore ..... long tons | 199,599 | [3] | [3] | [3] |
| Talc, pyrophyllite, and soapstone | 166,551 | 1,552,783 | 153,710 | 1,419,227 |
| Tungsten concentrate, 60-percent $WO_3$ basis | 4,383 | 16,200,924 | 3,719 | 13,449,378 |
| Zinc (recoverable content of ores, etc.) | 6,836 | 1,681,656 | 8,049 | 2,205,426 |
| Values that cannot be disclosed: Asbestos, barite, bromine, calcium-magnesium chloride, carbon dioxide, masonry cement (1956), diatomite, feldspar, abrasive garnet (1955), iodine, magnesite, mica, molybdenum, platinum group metals (crude), potassium salts, pyrites, rare-earth metal concentrate, slate, sodium carbonate and sulfate, recovered elemental sulfur, titanium iron concentrate (non-titanium use, 1955), uranium ore (1956), and values indicated by footnote 3 | ..... | [5] 55,689,169 | ..... | 69,025,033 |
| Total California [6] | ..... | [5] 1,456,513,000 | ..... | 1,555,263,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing company confidential data.
[4] Excludes shipments to Government low-grade depots and custom mills, but quantity and value for this material are as follows: 1955—manganese ore, 4,244 short tons, $292,637, and low-grade manganese ore, 18,395 short tons, $638,651. 1956—manganese ore, 293 short tons, $19,630.
[5] Revised figure.
[6] Total has been adjusted to eliminate duplicating value of clays and stone included in cement and lime.

sodium sulfate, and magnesium compounds from sea water were the most outstanding. Gains were also made in yields of bromine, calcium chloride, and iodine. The increased tonnage of salt produced, due largely to greater use as a water softener and for chlorine manufacture, was noteworthy.

Although the total quantity and value of clays mined exceeded that in the preceding year, all classes of clays declined except miscellaneous clay used in cement and fireclay, which increased sharply owing to

Digitized by Google

TABLE 2.—Average unit value of selected mineral commodities produced in California, 1947–51 (average) and 1952–56 [1]

| Commodity | 1947–51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Cement (average net mill realization) dollars per barrel | 2.25 | 2.54 | 2.67 | 2.76 | 2.86 | 3.08 |
| Copper [2] cents per pound | 21.5 | 24.2 | 28.7 | 29.5 | 37.3 | 42.5 |
| Gold [3] dollar per troy ounce | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 |
| Iron ore (average value at mine) dollar per long ton | 4.46 | 6.09 | 6.76 | 6.99 | 7.12 | 7.75 |
| Lead [2] cents per pound | 15.8 | 16.1 | 13.1 | 13.7 | 14.9 | 15.7 |
| Mercury [4] dollars per 76-pound flask | 106.22 | 199.10 | 193.03 | 264.39 | 290.35 | 259.92 |
| Silver [5] cents per troy ounce | 90.5 | 90.5+ | 90.5+ | 90.5+ | 90.5+ | 90.5+ |
| Tungsten concentrate dollars per short-ton unit $WO_3$ | 33.54 | 63.44 | [6] 62.46 | [6] 62.61 | 61.79 | 57.90 |
| Zinc [2] cents per pound | 14.0 | 16.6 | 11.5 | 10.8 | 12.3 | 13.7 |

[1] Prices are discussed in detail in commodity chapters of volume I, Minerals Yearbook.
[2] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1947 includes bonus payments by Office of Metals Reserve for overquota production.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Average quoted price at New York.
[5] Treasury buying price for newly mined silver, July 1, 1946, to Dec. 31, 1947—$0.905; 1948–56—$0.9050505.
[6] Based on average of GSA purchases.

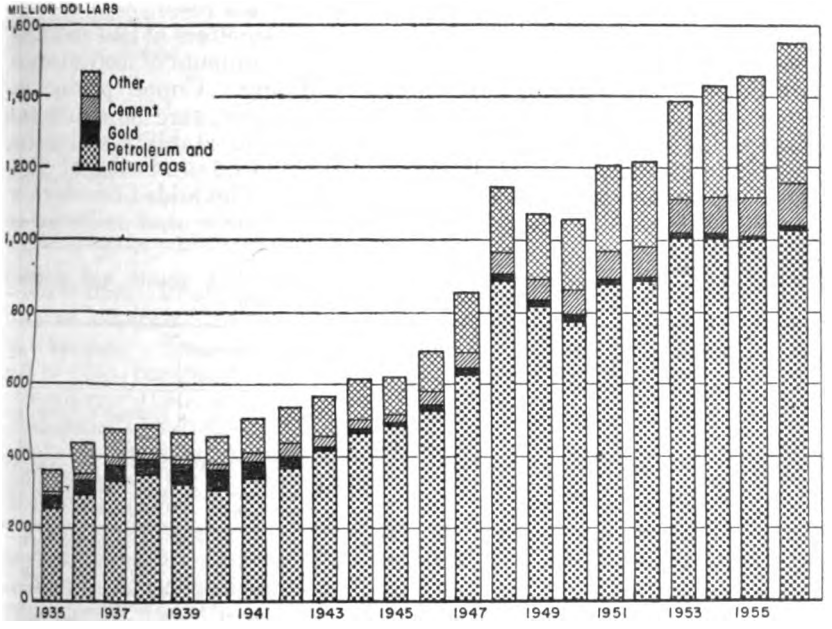



FIGURE 1.—Value of petroleum and natural gas, gold, cement, and total value of mineral production in California, 1935–56.

the sharp rise in demand for heavy clay products. The production of talc, pyrophyllite, and soapstone dropped moderately, because there was less demand for these materials as a carrier in insecticides and as a filler in rubber compared with 1955. The yield of feldspar had an apparent sharp rise owing to the classification of a large tonnage of feldspathic sand (produced in 1956) as crude feldspar. In 1955 a like tonnage of the material was produced and classified as glass sand.



Digitized by Google

The output of diatomite increased in 1956, continuing a trend. A new use—as lightweight aggregate—contributed to the rise. Only a small tonnage of barite was quarried during the year; however, relatively large shipments were made to grinding plants from mine stocks, largely for use in rotary-drilling fluids.

The tonnage of sulfur ore mined by California's only producer was below that in 1955. The magnitude of this output was controlled by the needs of the company copper-ore-leaching plant in Nevada. Conversely, the tonnage of sulfur recovered as a byproduct of petroleum refining increased over 1955 for this material. Pyrite production from the one active property lagged, as the operation was being converted from underground to open-pit mining. The output of strontium minerals was substantially above the small yield of 1955, filling the temporary needs of a Nevada manganese-ore concentrator. The small production of magnesite was below that in the preceding year, as demand lessened. The value of gem stones mined and collected in 1956, which was partly estimated, declined from 1955.

The producers of metals, with some notable exceptions, operated in a good climate in 1956, as prices and demand were generally favorable. Iron-ore production reflected California's record pig-iron output and rose to a new high. The output at smelters of lead and zinc from the State's ores increased, as did the shipments of molybdenum concentrate—a byproduct of tungsten milling. Copper production increased but continued to be minor, as there were no significant discoveries or developments of copper ore. The stability of Government purchasing was responsible for the increased production of chromite and manganese ores and concentrates. The added incentive of carlot purchases of chromite by the Government was instituted in

**TABLE 3.—Principal custom mills, commercial grinding plants, and primary smelters in California in 1956**

| Name | County | Nearest city or town | Minerals processed | Remarks |
|---|---|---|---|---|
| Industrial Minerals & Chemical Co. | Alameda | Berkeley | Nonmetals | Contract grinding—minerals purchased. |
| Yuba Milling Co | do | Emeryville | do | Do. |
| American Smelting and Refining Co. | Contra Costa | Selby | Gold, silver, copper, zinc. | Smelter, refinery, and fuming plant. |
| El Diablo Mining Co | Inyo | Bishop | Tungsten ore and concentrates. | 50-ton-a-day gravity concentrator. |
| Union Carbide Nuclear Co. | do | Pine Creek | do | 1,000-ton-a-day flotation and chemical plant. |
| Macco Corp. (Champco) | Kern | Rosamond | Nonmetals | Commercial fine grinding. |
| Butte Lode Mining Co | do | Randsburg | Gold, silver, tungsten. | 36-ton-a-day gravity concentrator. |
| American Minerals Co | Los Angeles | Los Angeles | Nonmetals | Commercial grinding. |
| Hill Bros. Chemical Co | do | do | do | Custom mill. |
| Southern California Minerals Co. | do | do | do | Contract grinding. |
| Kennedy Minerals Co | do | do | do | Commercial grinding. |
| Western Talc Co | do | do | do | Contract grinding. |
| Los Angeles Chemical Co. | do | do | do | Contract grinding—minerals purchased. |
| Piute Mining & Milling Co. | Mono | Bishop | do | 50-ton-a-day gravity contractor. |
| Empire Star Mines Co., Ltd. | Nevada | Grass Valley | Gold and silver | 500-ton-a-day amalgamation-cyanide mill. |
| Commercial Minerals Co | San Francisco | San Francisco | Nonmetals | Contract grinding—minerals purchased. |
| Wildberg Bros. Smelting & Refining Co. | do | do | Gold, silver, platinum. | Smelting, refining, manufacturing. |

Digitized by Google

1956. Tungsten-concentrate output slumped as the Government purchase program (in effect at the first of the year) came to a close in the latter part of 1956. Government buying paused during the interval while a new program was being drafted. Gold production fell sharply, primarily as a result of rising costs, which caused California's principal lode-gold mine to close. The mercury yield was below that in 1955, reflecting to some extent the lower average price but largely because two of the State's principal producers of the preceding year had curtailed output while exploring for new ore. Silver production, which normally reflects lead and zinc output, dropped in 1956—the result of lower silver content in the base-metal ores. The small yield of platinum from gold dredging was even below that in 1955. Production of rare-earth concentrates remained at about a par with the previous year, as the one producer sought a stable market. Uranium-ore production was reported for the first time, and shipments in the first 6 months of 1956 were below those in the latter half of 1955.

**TABLE 4.—Sand and gravel, crushed stone, and portland cement sold or used in 1956, by method of transportation**

| Material | Tonnage transported, by method | | | | |
|---|---|---|---|---|---|
| | Railroad | Motor truck | Waterway | Not stated[1] | Total |
| Sand and gravel (commercial) | 6,640,105 | 66,006,260 | | 1,322,203 | 73,968,568 |
| Crushed stone (commercial) | 608,649 | 25,832,324 | 1,434,365 | 714,780 | 28,590,118 |
| Portland cement | 1,854,101 | 5,480,210 | 41,192 | 10,939 | 7,386,442 |
| Total | 9,102,855 | 97,318,794 | 1,475,557 | 2,047,922 | 109,945,128 |

[1] Includes interplant transfers to batching units, etc.

**Government Programs.**—There was increased activity under the Defense Minerals Exploration Administration (DMEA) program during the year. Twenty-three contracts were in effect during all or part of 1956, compared with 16 in 1955. Nine new contracts became active during 1956—4 for mercury and 1 each for copper-zinc, copper-nickel-cobalt, lead-zinc, tungsten, and uranium.

General Services Administration (GSA) initiated a Government carlot program for chromite in 1956—a program that was in effect for manganese ore in 1955. Shipments of chromite and manganese ores and concentrates and tungsten concentrates were accepted for payment by GSA and stockpiled at out-of-State depots. Only one California producer shipped manganese ore for stockpiling at a low-grade depot, and the tonnage was negligible compared with 1955. The Government purchase program included mercury, but the open-market value for this metal was above the purchase minimum throughout the year, and no purchases were made in 1956.

**Employment in the Mineral Industries.**—The number of workers employed by the mineral industries declined from 1955 figures; however, the number of employees engaged in nonmetal mining and quarrying rose substantially in line with California's greater nonmetal mineral production in 1956. Wages increased throughout all phases of the mineral industries during the year; metal-mining employees received the highest hourly advance. Although the employees in all segments of the industry enjoyed higher average weekly

Digitized by Google

**TABLE 5.—Defense Minerals Exploration Administration contracts active during 1956**

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total amount | Government participation (percent) |
| ALTINE | | | | | |
| Wm. C. Morrison & Sons | Valpine | Tungsten | Sept. 22, 1954 | 16,000 | 75 |
| BUTTE | | | | | |
| Helmke, Thomas & Janssen | Lambert | Chromite | Dec. 17, 1954 | 51,474 | 50 |
| FRESNO | | | | | |
| Vance H. Hongola | Obelisk | Tungsten | Dec. 8, 1955 | 12,000 | 75 |
| HUMBOLDT | | | | | |
| Providence Tuolumne Gold Mines, Inc. | Copper Bluff | Copper, zinc | June 18, 1953 | 58,820 | 50 |
| INYO | | | | | |
| Harvey E. Briggs | Red Cloud | Lead, zinc | Mar. 24, 1952 | 23,980 | 50 |
| Coso Uranium, Inc | White Swan | Uranium | Aug. 21, 1956 | 30,725 | 75 |
| Helen & J. S. Wisdom | Bright Star | Tungsten | July 23, 1956 | 7,400 | 75 |
| LAKE | | | | | |
| California Quicksilver Mines, Inc. | Abbott | Mercury | Sept. 15, 1951 | 163,540 | 75 |
| MADERA | | | | | |
| Climax Molybdenum Co | Shadow Creek | Lead, zinc | May 28, 1956 | 100,040 | 50 |
| NAPA | | | | | |
| Hugh M. Simmons | Granada | Mercury | June 28, 1955 | 17,800 | 75 |
| Murray A. Schutz | Harrison | do | May 2, 1956 | 28,540 | 75 |
| Toyon Mines Co | Toyon | do | Aug. 24, 1956 | 16,120 | 75 |
| NEVADA | | | | | |
| Idaho-Maryland Mines Corp | Brunswick | Tungsten | Dec. 28, 1954 | 118,966 | 75 |
| SAN BENITO | | | | | |
| New Idria Mining & Chemical Co. | West Idria | Mercury | July 18, 1952 | 265,126 | 75 |
| Do | do | do | Apr. 4, 1955 | 129,331 | 75 |
| SAN BERNARDINO | | | | | |
| Owl Springs Co., Inc | Owl's Head | Manganese | Jan. 17, 1956 | 32,800 | 75 |
| SAN DIEGO | | | | | |
| Mac Afee & Co | Friday | Copper-nickel-cobalt. | Mar. 12, 1956 | 28,600 | 75 |
| SAN LUIS OBISPO | | | | | |
| Smith & Biaggini | Buena Vista | Mercury | Oct. 18, 1956 | 11,060 | 75 |
| Frank Vollmer | Oceanic | do | Feb. 28, 1955 | 6,639 | 75 |
| SHASTA | | | | | |
| The Glidden Co | Bully Hill | Copper-zinc | Oct. 18, 1951 | 294,300 | 50 |
| Shasta Copper & Uranium Co., Inc. | Shasta King | do | May 24, 1955 | 104,572 | 50 |
| Shasta-Phelps Dodge Joint Venture. | Balaklala | do | Aug. 3, 1956 | 109,820 | 50 |
| SONOMA | | | | | |
| Sonoma Quicksilver Mines, Inc | Mount Jackson | Mercury | June 8, 1956 | 77,900 | 75 |
| TRINITY | | | | | |
| Smith & Austin | Altoona | do | June 27, 1955 | 95,260 | 75 |

Digitized by Google

earnings, those engaged by the nonmetals industries received the greater gain because of a longer work week. The past several years (including 1956) have indicated a continuing trend toward a diminishing number of disabling work injuries in the mineral industries. This decline in fatal and nonfatal injuries has been less marked in metal mining due to the higher percentage of underground operations in this segment of the industry and the greater hazards involved. The influencing factors that have contributed most to the improved safety record have been: Enlarged and improved safety programs by most of the major producers of mineral commodities, better and more frequent coverage of operating facilities by State inspection agencies through a greater number of more technically trained personnel, and

**TABLE 6.—Estimated number of nonsupervisory personnel in the mineral industry 1947–51 (average) 1952–56** [1]

| Year | Metal mining | Mineral-fuel production | Nonmetallic mining and quarrying | Total |
|---|---|---|---|---|
| 1947–51 (average) | 3,400 | 24,700 | 5,600 | 33,700 |
| 1952 | 3,300 | 26,100 | 6,600 | 36,000 |
| 1953 | 3,200 | 27,400 | 6,600 | 37,200 |
| 1954 | 3,000 | 26,800 | 6,400 | 36,200 |
| 1955 | 3,300 | 27,400 | 6,600 | 37,300 |
| 1956 | 2,900 | 26,300 | 7,600 | 36,800 |

[1] Data from Division of Labor Statistics and Research, California Department of Industrial Relations, in cooperation with the Bureau of Labor Statistics.

**TABLE 7.—Average wages and hours worked in the mineral industries, 1955–56** [1]

| Industry | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Average hourly rate | Average weekly earnings | Average hours worked per week | Average hourly rate | Average weekly earnings | Average hours worked per week |
| Metal mining | $2.03 | $90.31 | 44.4 | $2.25 | $97.70 | 43.4 |
| Mineral-fuel production | 2.45 | 97.36 | 39.7 | 2.60 | 102.96 | 39.6 |
| Nonmetallic mining and quarrying | 2.32 | 95.82 | 41.3 | 2.49 | 105.24 | 42.4 |

[1] Data from Division of Labor Statistics and Research, California Department of Industrial Relations, in cooperation with the Bureau of Labor Statistics.

**TABLE 8.—Fatal and nonfatal disabling work injuries, mineral industries, 1955–56** [1]

| Industry | 1955 | | | 1956 | | | Disabling work injuries per 1,000 workers [2] | |
|---|---|---|---|---|---|---|---|---|
| | Fatal | Nonfatal | Total | Fatal | Nonfatal | Total | 1955 | 1956 |
| Metal mining | 12 | 523 | 535 | 7 | 443 | 450 | 162 | 155 |
| Mineral-fuel production | 11 | 2,058 | 2,069 | 7 | 1,696 | 1,703 | 76 | 65 |
| Nonmetallic mining and quarrying | 9 | 457 | 466 | 5 | 447 | 452 | 71 | 59 |
| Total | 32 | 3,038 | 3,070 | 19 | 2,586 | 2,605 | 82 | 71 |

[1] California Department of Industrial Relations, Division of Labor Statistics and Research, California Work Injuries, 1956.
[2] A disabling work injury is defined as one that causes disability beyond the day of the accident.

Digitized by Google

the assistance afforded the mineral industries through the efforts of the Governor's Safety Conference, which has made the individual worker more safety conscious.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Antimony.**—No activity was reported at California antimony mines in 1956. The chief reasons for continued inactivity were low ore prices and excessive shipping distances to ore markets. Last reported production was in 1952. An undetermined quantity of recoverable antimony was contained in gold, lead, and lead-zinc ores shipped to lead smelters from mines in several counties.

**Cadmium.**—Zinc concentrate from ores of the Darwin and Shoshone mine groups in Inyo County contained an appreciable quantity of recoverable cadmium. The tonnage of cadmium recovered at zinc smelters outside the State was undetermined but was estimated to have been higher than in 1955 due to the increased output of zinc concentrate.

**Chromite.**—Aided to some extent by the Government chromite carlot program initiated in 1956, whereby carload lots of ore and concentrate were accepted by the Government at railheads, the total shipments of chromite ore and concentrate in California during 1956 exceeded those in the preceding year. Before this new regulation, the shippers of ore and concentrate paid the costs of carlot delivery to the Grants Pass (Oreg.) Purchase Depot. It was significant that consignments of direct-shipping ore containing less than 45 percent $Cr_2O_3$ decreased 12 percent and those with more than 45 percent $Cr_2O_3$ decreased 16 percent, while shipments of concentrate containing less than 45 percent and more than 45 percent $Cr_2O_3$ increased 84 and 13 precent, respectively, over the preceding year. In the transition to mining lower grade chromite ores (due to gradual depletion of high-grade deposits) fewer properties were worked in 1956 than in 1955.

The mining areas of the State, in the order of ore tonnage produced, were the Coast Range, Klamath Mountains, and the Sierra Nevada Range. The mining properties in the counties of the Coast Range yielded most of the milling-grade ore and had the highest output of chromite concentrate. The mines of the Klamath Mountains produced the greatest percentage of high-grade shipping ore. The Government bought the entire California production of chromite ore and concentrate for stockpiling. Chromite used in the State for manufacturing chromium salts and refractories, except for a small tonnage received from an Oregon deposit, was imported. California's major producers of chromite ore and concentrate were: Castella Mining & Milling Co., from the Lambert mine in Butte County; and Southwest Oil Co., from the Butler Estate in Fresno County.

**Copper.**—California's minor copper production was 859 tons from all sources in 1956—a 40-percent increase over 1955 and a high since 1951. Inyo County produced 73 percent of the State total, most of which was a byproduct of the tungsten ores of the Bishop (Pine

Digitized by Google

**TABLE 9.—Shipments of chromite ore and concentrate in 1956, by counties**

| County | Active mines and prospects | Rank in State (by value) | Milling ore treated [1] (gross long tons) | Material shipped (dry weight, long tons) | | | | | Value |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total wet weight (long tons) | Under 45 percent $Cr_2O_3$ | | Over 45 percent $Cr_2O_3$ | | |
| | | | | | Ore | Concentrate | Ore | Concentrate | |
| Butte | 1 | 3 | [2] | [2] | [2] | [2] | [2] | [2] | [2] |
| Del Norte | 28 | 5 | 595 | 1,922 | 403 | 1,310 | 18 | 156 | $210,159 |
| Fresno | 3 | 2 | [2] | [2] | [2] | [2] | [2] | [2] | [2] |
| Glenn | 1 | 9 | 548 | 219 | ------- | ------- | 24 | 183 | 21,872 |
| Humboldt | 1 | 12 | ------- | [2] | ------- | [2] | ------- | ------- | [2] |
| Monterey | 1 | 16 | ------- | [2] | ------- | [2] | ------- | ------- | [2] |
| Napa | 2 | 10 | 172 | 122 | 10 | 41 | ------- | 68 | 14,308 |
| Placer | 5 | 11 | ------- | 109 | 12 | 96 | ------- | ------- | 11,295 |
| San Benito | 2 | 7 | 1,003 | 408 | ------- | 7 | ------- | 368 | 43,629 |
| San Luis Obispo | 9 | 1 | 20,830 | 9,079 | 261 | 607 | 5,260 | 2,372 | 718,677 |
| Santa Barbara | 2 | 6 | [2] | [2] | [2] | [2] | ------- | [2] | [2] |
| Siskiyou | 22 | 4 | 2,796 | 2,102 | 38 | 990 | 103 | 841 | 215,666 |
| Stanislaus | 1 | 13 | [2] | [2] | ------- | ------- | ------- | [2] | [2] |
| Tehama | 14 | 8 | 853 | 423 | 40 | 126 | ------- | 230 | 41,343 |
| Trinity | 3 | 14 | ------- | 36 | 24 | 12 | ------- | ------- | 3,487 |
| Undistributed | 2 | 15 | 19,046 | 9,760 | 409 | 611 | 2,960 | 5,083 | 911,520 |
| Total | 97 | ------- | 45,843 | 24,180 | 1,197 | 3,800 | 8,365 | 9,301 | 2,191,956 |

[1] Partly estimated.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

**TABLE 10.—Mine production of gold, silver copper, lead, and zinc in 1956, by counties, in terms of recoverable metals**

| County | Mines producing [1] | | Gold | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Lode | | Placer | | Total | |
| | Lode | Placer | Fine ounces | Value | Fine ounces | Value | Fine ounces | Value |
| Amador, Calaveras, and Del Norte [2] | 8 | 5 | 155 | $5,425 | 281 | $9,835 | 436 | $15,260 |
| Butte | ------- | 8 | ------- | ------- | 72 | 2,520 | 72 | 2,520 |
| El Dorado [2] | 5 | 1 | 2,695 | 94,325 | [2] | [2] | [2] 2,695 | [2] 94,325 |
| Fresno, Stanislaus, and Yuba [2] [3] | ------- | 7 | ------- | ------- | [2] 76,363 | [2] 2,672,705 | [2] 76,363 | [2] 2,672,705 |
| Humboldt, Imperial, and Mono [2] [4] | 4 | ------- | [4] 68 | [4] 2,380 | ------- | ------- | [4] 68 | [4] 2,380 |
| Inyo | 18 | ------- | 1,704 | 59,640 | 2 | 70 | 1,706 | 59,710 |
| Kern [2] | 10 | 1 | 4,453 | 155,855 | [2] | [2] | [2] 4,453 | [2] 155,855 |
| Los Angeles, Madera, and Plumas [2] | 3 | 5 | 82 | 2,870 | 474 | 16,590 | 556 | 19,460 |
| Mariposa [2] | 7 | 1 | 1,565 | 54,775 | [2] | [2] | [2] 1,565 | [2] 54,775 |
| Merced | ------- | 1 | ------- | ------- | 27 | 945 | 27 | 945 |
| Nevada | 7 | 7 | 22,568 | 789,880 | 294 | 10,290 | 22,862 | 800,170 |
| Placer [4] | 2 | 11 | [4] | [4] | 420 | 14,700 | [4] 420 | [4] 14,700 |
| Riverside | 4 | ------- | 3 | 105 | ------- | ------- | 3 | 105 |
| Sacramento | ------- | 7 | ------- | ------- | 49,641 | 1,737,435 | 49,641 | 1,737,435 |
| San Bernardino | 26 | ------- | 209 | 7,315 | ------- | ------- | 209 | 7,315 |
| San Diego, Shasta, Trinity, and Tuolumne [2] | 14 | 9 | 285 | 9,975 | 6,291 | 220,185 | 6,576 | 230,160 |
| Sierra | 5 | 6 | 10,547 | 369,145 | 107 | 3,745 | 10,654 | 372,890 |
| Siskiyou | 3 | 4 | 15,035 | 526,225 | 475 | 16,625 | 15,510 | 542,850 |
| Total | 116 | 73 | 59,369 | 2,077,915 | 134,447 | 4,705,645 | 193,816 | 6,783,560 |

See footnotes at end of table.

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals—Continued**

| County | Silver | | | | | | Copper | | Lead | | Zinc | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lode | | Placer | | Total | | | | | | | | |
| | Fine ounces | Value | Fine ounces | Value | Fine ounces | Value | Pounds | Value | Pounds | Value | Pounds | Value | |
| Amador, Calaveras, and Del Norte [1] | 7,644 | $6,918 | 26 | $24 | 7,670 | $6,942 | 235,500 | $100,088 | 6,700 | $1,052 | | | $123,342 |
| Butte | | | 6 | 5 | 6 | 5 | | | | | | | 2,525 |
| El Dorado [1] | 1,741 | 1,576 | (3) | (3) | [1] 1,741 | [1] 1,576 | 67,800 | 28,815 | 10,600 | 1,664 | 2,700 | $370 | [1] 126,750 |
| Fresno, Stanislaus, and Yuba [1 3] | | | [1] 4,184 | [1] 3,788 | [1] 4,184 | [1] 3,788 | | | | | | | [1 3] 2,676,493 |
| Humboldt, Imperial, and Mono [1 4] | [4] 47 | [4] 42 | | | [4] 47 | [4] 42 | 2,300 | 978 | | | | | [4] 3,400 |
| Inyo | 853,133 | 772,128 | 1 | 1 | 853,134 | 772,129 | 1,255,500 | 533,588 | 18,523,400 | 2,908,174 | 16,044,800 | 2,198,138 | 6,471,739 |
| Kern [1] | 15,215 | 13,770 | (3) | (3) | [1] 15,215 | [1] 13,770 | 300 | 127 | 500 | 79 | 900 | 123 | [1] 169,954 |
| Los Angeles, Madera, and Plumas [2] | 286 | 259 | 66 | 60 | 352 | 319 | 26,600 | 11,305 | | | | | 31,084 |
| Mariposa [1] | 377 | 341 | (3) | (3) | [1] 377 | [1] 341 | 500 | 212 | | | | | [1] 55,328 |
| Merced | | | 3 | 3 | 3 | 3 | | | | | | | 948 |
| Nevada | 7,434 | 6,728 | 49 | 44 | 7,483 | 6,772 | | | | | | | 806,942 |
| Placer [4] | (4) | (4) | 40 | 36 | [4] 40 | [4] 36 | | | | | | | [4] 14,736 |
| Riverside | 226 | 205 | | | 226 | 205 | 2,700 | 1,148 | | | | | 1,458 |
| Sacramento | | | 2,166 | 1,960 | 2,166 | 1,960 | | | | | | | 1,739,395 |
| San Bernardino | 3,671 | 3,323 | | | 3,671 | 3,323 | 92,900 | 39,482 | 34,500 | 5,416 | 8,800 | 1,205 | 56,741 |
| San Diego, Shasta, Trinity, and Tuolumne [2] | 1,571 | 1,422 | 705 | 637 | 2,276 | 2,059 | 33,900 | 14,407 | 16,300 | 2,559 | 40,800 | 5,590 | 254,775 |
| Sierra | 2,134 | 1,931 | 10 | 9 | 2,144 | 1,940 | | | | | | | 374,830 |
| Siskiyou | 37,340 | 33,795 | 64 | 58 | 37,404 | 33,853 | | | | | | | 576,703 |
| Total | 930,819 | 842,438 | 7,320 | 6,625 | 938,139 | 849,063 | 1,718,000 | 730,150 | 18,592,000 | 2,918,944 | 16,098,000 | 2,205,426 | 13,487,143 |

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

[2] Combined to avoid disclosing individual output.

[3] El Dorado, Kern, and Mariposa Counties placer gold and silver combined with Fresno, Stanislaus, and Yuba Counties to avoid disclosing individual company confidential data.

[4] Placer County lode gold and silver combined with Humboldt, Imperial, and Mono Counties to avoid disclosing individual company confidential data.

Digitized by Google

Creek) district and the lead-zinc ores of the Darwin (Coso) district. Amador County was next highest, producing slightly more than 10 percent, and was followed by San Bernardino, with about 5 percent. Copper production from straight copper ore—largely from the West Belt district of Amador, Calaveras, and Madera Counties—was nearly 31 percent of the State total, which came from 38 mines in 13 counties.

Several new mines were opened, and abandoned workings of others were reactivated in response to price stimulation. However, the relatively small copper output in California reflected a dearth of deposits that could supply enough ore to warrant the capital outlay for beneficiation plants necessary to treat the California low-grade, and usually complex, copper ores. Copper ore and concentrate produced in the State were shipped to Washington, Utah, and Texas smelters. Some copper was recovered in matte form from ore and concentrate treated at lead smelters in California and Utah and from residues obtained at Montana zinc plants. The major copper producers in California during 1956 were: Union Carbide Nuclear Co., Bishop (Pine Creek) district, (tungsten ore) and The Anaconda Co., Darwin (Coso) district (lead-zinc ore), both in Inyo County; and Fitzgerald, Smith & Associates, West Belt district, Amador County (copper ore).

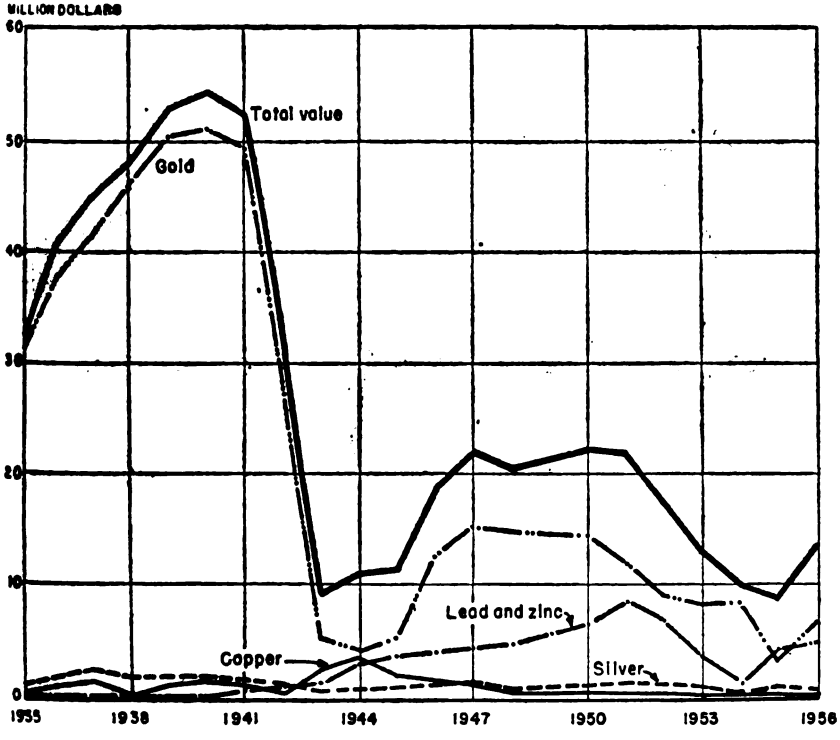



FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in California, 1935–56.

Digitized by Google

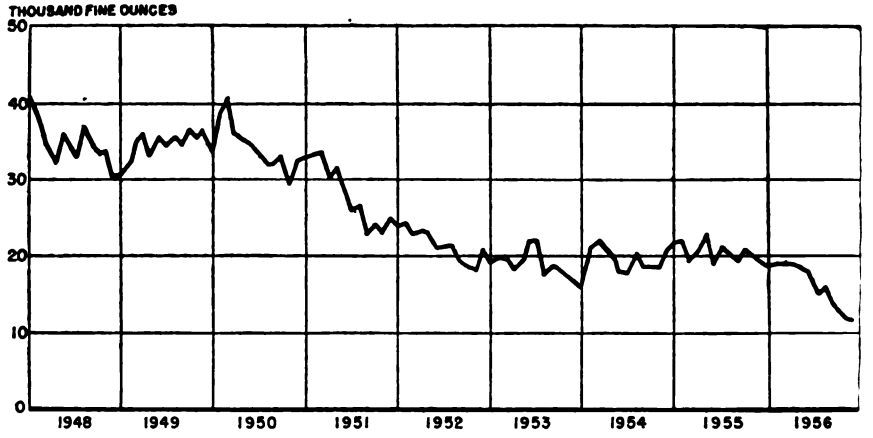



FIGURE 3.—Mine production of gold in California, 1948–56, by months, in terms of recoverable gold.

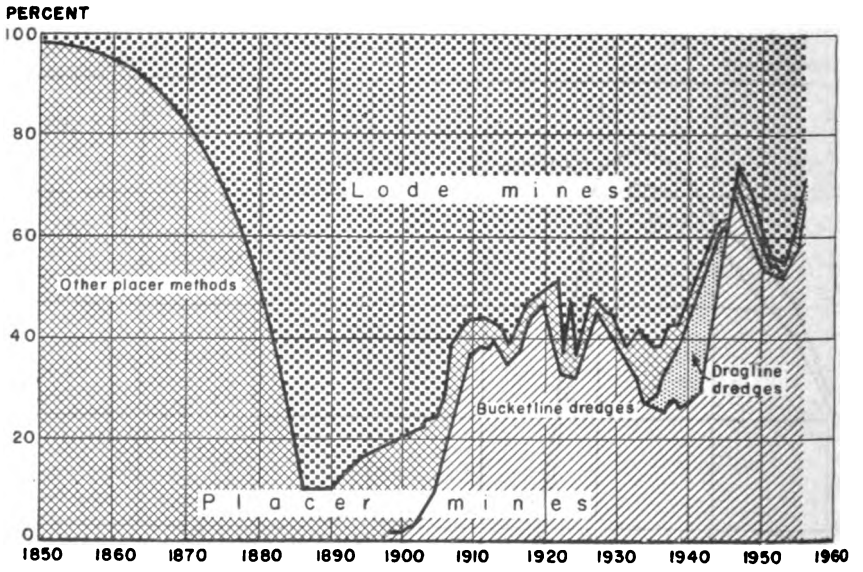



FIGURE 4.—Percentage of total California gold produced at lode and placer mines and by various methods of placer mining, 1850–1956.

Digitized by Google

**TABLE 11.—Gold production at placer mines, 1947–51 (average), 1952–56, and total 1848–1956, by classes of mines and methods of recovery [1]**

| Class and method | Mines producing [2] | Washing plants (dredges) | Material treated (cubic yards) | Gold recovered | | |
|---|---|---|---|---|---|---|
| | | | | Fine ounces | Value | Average value per cubic yard |
| Surface placers: | | | | | | |
| Gravel mechanically handled: | | | | | | |
| Bucketline dredges: | | | | | | |
| 1947–51 (average) | 18 | 31 | 85,005,140 | 230,842 | $8,079,456 | $0.095 |
| 1952 | 6 | 16 | 49,881,800 | 131,806 | 4,613,210 | .092 |
| 1953 | 3 | 14 | 45,528,800 | 119,022 | 4,165,770 | .091 |
| 1954 | 3 | 15 | 44,910,720 | 134,096 | 4,693,360 | .105 |
| 1955 | 3 | 11 | 40,810,210 | 142,548 | 4,989,180 | .122 |
| 1956 | 3 | 10 | 36,356,640 | 130,631 | 4,572,085 | .126 |
| Dragline dredges: [3] | | | | | | |
| 1947–51 (average) | 25 | 22 | 3,287,700 | 16,083 | 562,891 | .172 |
| 1952 | 7 | 7 | 1,447,700 | 6,655 | 232,925 | .161 |
| 1953 | 8 | 7 | 302,600 | 935 | 32,725 | .107 |
| 1954 | 9 | 9 | 179,400 | 1,466 | 51,310 | .286 |
| 1955 | 7 | 7 | 131,710 | 589 | 20,615 | .157 |
| 1956 | 7 | 7 | 328,010 | 871 | 30,485 | .093 |
| Suction dredges: | | | | | | |
| 1947–51 (average) | 10 | 9 | 170,760 | 885 | 30,982 | .196 |
| 1952 | 9 | 9 | 74,100 | 305 | 10,675 | .144 |
| 1953 | 7 | 8 | 87,700 | 341 | 11,935 | .136 |
| 1954 | 3 | 3 | 3,800 | 53 | 1,855 | .488 |
| 1955 | 5 | 5 | 2,400 | 46 | 1,610 | .670 |
| 1956 | 2 | 2 | 23,920 | 27 | 945 | .040 |
| Nonfloating washing plants: [3 4] | | | | | | |
| 1947–51 (average) | 22 | 22 | 99,620 | 2,806 | 98,210 | .624 |
| 1952 | 18 | 18 | 11,600 | 1,462 | 51,170 | 2.040 |
| 1953 | 24 | 24 | 40,800 | 1,143 | 40,005 | .486 |
| 1954 | 24 | 24 | 8,820 | 2,298 | 80,430 | .836 |
| 1955 | 18 | 18 | 80,140 | 1,865 | 65,275 | .288 |
| 1956 | 18 | 22 | 2,520 | 1,624 | 56,840 | 1.583 |
| Gravel hydraulically handled: | | | | | | |
| 1947–51 (average) | 25 | ---------- | 316,260 | 1,295 | 45,311 | .167 |
| 1952 | 9 | ---------- | 53,100 | 409 | 14,315 | .270 |
| 1953 | 16 | ---------- | 216,200 | 469 | 16,415 | .076 |
| 1954 | 8 | ---------- | 43,600 | 235 | 8,225 | .189 |
| 1955 | 7 | ---------- | 115,520 | 230 | 8,050 | .070 |
| 1956 | 6 | ---------- | 9,090 | 101 | 3,535 | .389 |
| Small-scale hand methods: [5] | | | | | | |
| 1947–51 (average) | 69 | ---------- | 256,762 | 4,761 | 166,642 | .774 |
| 1952 | 48 | ---------- | 51,900 | 1,576 | 55,160 | 1.063 |
| 1953 | 53 | ---------- | 76,500 | 1,271 | 44,485 | .583 |
| 1954 | 46 | ---------- | 119,800 | 1,802 | 63,070 | .527 |
| 1955 | 28 | ---------- | 94,130 | 1,182 | 41,370 | .439 |
| 1956 | 26 | ---------- | 19,281 | 1,029 | 36,015 | .459 |
| Underground placers: | | | | | | |
| Drift: | | | | | | |
| 1947–51 (average) | 11 | ---------- | 5,860 | 243 | 8,491 | 2.559 |
| 1952 | 11 | ---------- | 3,700 | 130 | 4,550 | 1.230 |
| 1953 | 12 | ---------- | 3,330 | 165 | 5,775 | 1.734 |
| 1954 | 17 | ---------- | 6,580 | 247 | 8,645 | 1.313 |
| 1955 | 14 | ---------- | 4,780 | 153 | 5,355 | 1.120 |
| 1956 | 11 | ---------- | 3,880 | 164 | 5,740 | 1.481 |
| Grand total placers: | | | | | | |
| 1947–51 (average) | 180 | ---------- | 89,142,102 | 256,914 | 8,991,983 | 1.002 |
| 1952 | 108 | ---------- | 51,523,900 | 142,343 | 4,982,005 | .097 |
| 1953 | 123 | ---------- | 46,255,930 | 123,346 | 4,317,110 | .093 |
| 1954 | 110 | ---------- | 45,272,720 | 140,197 | 4,906,895 | .106 |
| 1955 | 82 | ---------- | 41,238,890 | 146,613 | 5,131,455 | .122 |
| 1956 | 73 | ---------- | 36,802,790 | 134,447 | 4,705,645 | .126 |
| 1848–1956 | ---------- | ---------- | [6] | 67,504,309 | 1,498,388,461 | [6] |

[1] For historical data by years, see Minerals Yearbook, Review of 1940, p. 219.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Includes commercial rock plants and tungsten mines that produced byproduct gold from gravels; byproduct gold is included with gold recovered, but material treated and average value per cubic yard refer only to straight gold dredging.
[4] Includes all placer operations using power excavator and washing plants, both on dry land; when washing plant is movable outfit is termed "dry-land dredge."
[5] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
[6] Complete data not available.

Digitized by Google

**TABLE 12.—Mine production of gold, silver, copper, lead, and zinc 1947–51 (average), 1952–56, and total 1848–1956, in terms of recoverable metals [1]**

| Year | Mines producing [2] | | Material sold or treated (short tons) [3] | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 222 | 180 | 542,373 | 404,394 | $14,153,783 | 1,064,646 | $963,542 |
| 1952 | 141 | 108 | 424,783 | 258,176 | 9,036,160 | 1,099,658 | 995,246 |
| 1953 | 150 | 123 | 390,583 | 234,591 | 8,210,685 | 1,036,372 | 937,969 |
| 1954 | 131 | 110 | 231,517 | 237,886 | 8,326,010 | 309,575 | 280,181 |
| 1955 | 130 | 82 | 304,519 | 251,737 | 8,810,795 | 954,181 | 863,582 |
| 1956 | 116 | 73 | 281,102 | 193,816 | 6,783,560 | 938,139 | 849,063 |
| 1848–1956 | -------- | -------- | [4] | 105,079,394 | 2,379,882,442 | 117,861,242 | 95,884,693 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 1,021 | $437,980 | 11,861 | $3,706,372 | 7,020 | $2,030,865 | $21,292,542 |
| 1952 | 800 | 387,200 | 11,199 | 3,606,078 | 9,419 | 3,127,108 | 17,151,792 |
| 1953 | 382 | 219,268 | 8,664 | 2,269,968 | 5,358 | 1,232,340 | 12,870,230 |
| 1954 | 362 | 213,580 | 2,671 | 731,854 | 1,415 | 305,640 | 9,857,265 |
| 1955 | 613 | 457,298 | 8,265 | 2,462,970 | 6,836 | 1,681,656 | 14,276,301 |
| 1956 | 859 | 730,150 | 9,296 | 2,918,944 | 8,049 | 2,205,426 | 13,487,143 |
| 1848–1956 | 633,944 | 205,491,260 | 259,053 | 51,164,691 | 146,386 | 34,564,890 | 2,766,987,976 |

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; tungsten ore; and ore, old tailings, slag, flue dust, and pyritic ore residue shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] Figure not available.

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 18,704 | 75,821 | 59 | 740 | 594 |
| February | 18,776 | 77,611 | 55 | 748 | 647 |
| March | 18,933 | 83,478 | 102 | 739 | 791 |
| April | 18,931 | 99,894 | 101 | 826 | 703 |
| May | 18,689 | 83,312 | 70 | 930 | 637 |
| June | 18,232 | 89,340 | 73 | 1,004 | 630 |
| July | 15,260 | 76,539 | 95 | 789 | 588 |
| August | 16,025 | 80,276 | 69 | 819 | 749 |
| September | 13,835 | 65,584 | 45 | 769 | 703 |
| October | 12,707 | 70,580 | 61 | 734 | 706 |
| November | 11,982 | 64,386 | 59 | 578 | 673 |
| December | 11,742 | 71,318 | 70 | 620 | 628 |
| Total | 193,816 | 938,139 | 859 | 9,296 | 8,049 |

Digitized by Google

**TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals**

| Type of material processed and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Amalgamation: | | | | | |
| Ore | [1] 24,705 | 4,333 | ---------- | ---------- | ---------- |
| Total | 24,705 | 4,333 | ---------- | ---------- | ---------- |
| Cyanidation: | | | | | |
| Ore | 26,181 | 45,210 | ---------- | ---------- | ---------- |
| Total | 26,181 | 45,210 | ---------- | ---------- | ---------- |
| Total recoverable in bullion | 50,886 | 49,543 | ---------- | ---------- | ---------- |
| Concentration, and smelting of concentrates: | | | | | |
| Ore [2 4] | 7,484 | 713,182 | 1,379,400 | 13,877,400 | 14,857,400 |
| Total | 7,484 | 713,182 | 1,379,400 | 13,877,400 | 14,857,400 |
| Direct smelting: | | | | | |
| Ore [3 4] | 999 | 168,094 | 338,600 | 4,714,600 | 1,240,600 |
| Total | 999 | 168,094 | 338,600 | 4,714,600 | 1,240,600 |
| Placer | 134,447 | 7,320 | ---------- | ---------- | ---------- |
| Grand total | 193,816 | 938,139 | 1,718,000 | 18,592,000 | 16,098,000 |

[1] Includes gold recovered as "natural gold."
[2] Includes tungsten-ore concentrate.
[3] Includes flue dust.
[4] Combined to avoid disclosing individual company confidential data.

**TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals**

| Source | Number of mines [1] | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Lode ore: | | | | | | | |
| Dry gold | 78 | 90,190 | 57,062 | 59,102 | 3,400 | 10,800 | 3,600 |
| Dry gold-silver | 2 | 737 | 318 | 5,764 | ---------- | ---------- | ---------- |
| Dry silver | 3 | 168 | ---------- | 335 | 2,100 | ---------- | ---------- |
| Total | 83 | 91,095 | 57,380 | 65,201 | 5,500 | 10,800 | 2,600 |
| Copper | 38 | 14,866 | 292 | 10,758 | 529,500 | 7,500 | ---------- |
| Lead | 9 | 5,271 | 113 | 94,120 | 14,800 | 2,655,700 | 216,900 |
| Lead-zinc | 13 | 169,583 | 1,445 | 676,781 | 406,400 | 15,898,800 | 15,830,300 |
| Zinc | 2 | 76 | 2 | 983 | 100 | 2,900 | 6,400 |
| Total | 62 | 189,796 | 1,852 | 782,642 | 950,800 | 18,564,900 | 16,053,600 |
| Other "lode" material: | | | | | | | |
| Tungsten ore and flue dust [3] | 3 | [3] 211 | 137 | 82,976 | 761,700 | 16,300 | 40,800 |
| Total | 3 | [3] 211 | 137 | 82,976 | 761,700 | 16,300 | 40,800 |
| Total "lode" material | 116 | 281,102 | 59,369 | 930,819 | 1,718,000 | 18,592,000 | 16,098,000 |
| Gravel (placer operations) | 73 | (4) | 134,447 | 7,320 | ---------- | ---------- | ---------- |
| Total, all sources | 189 | ---------- | 193,816 | 938,139 | 1,718,000 | 18,592,000 | 16,098,000 |

[1] Detail will not necessarily add to total, because some mines produce more than one class of material.
[2] Combined to avoid disclosing individual company confidential data.
[3] Tungsten ore tonnage not included.
[4] 36,802,790 cubic yards. Does not include material washed at commercial gravel plants to produce 1,510 ounces of byproduct gold and 159 ounces of byproduct silver included in placer totals.

Digitized by Google

**TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals**

*A. For material treated at mills*

| | Material treated (short tons) | Recoverable in bullion | | Concentrate shipped to smelters [1] and recoverable metals | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Concentrate (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | | | | |
| Amador, Calaveras and Los Angeles [2] | 10,000 | 32 | 8 | 581 | 104 | 7,297 | 181,700 | 6,700 | |
| El Dorado | 7,129 | 24 | 2 | 379 | 2,671 | 1,739 | 67,800 | 10,600 | 2,700 |
| Inyo | 159,053 | 9 | 2 | 32,068 | 1,209 | 694,366 | 1,103,700 | 13,859,600 | 14,853,800 |
| Kern | 1,383 | 1,789 | 2,565 | 25 | 2,419 | 8,038 | 300 | 500 | 900 |
| Madera, Placer, and San Diego [3] | 548 | 13 | 2 | 79 | 80 | 247 | 25,100 | | |
| Mariposa | 435 | 1,476 | 355 | 7 | 75 | 11 | | | |
| Mono | 5 | 3 | | | | | | | |
| Nevada | 23,928 | 22,404 | 7,334 | 35 | 164 | 100 | | | |
| Riverside | 15 | 3 | 1 | | | | | | |
| San Bernardino | 114 | | | 10 | 75 | 1,153 | 800 | | |
| Shasta, Trinity, and Tuolumne [3] | 116 | 227 | 29 | 3 | 11 | 2 | | | |
| Sierra | 21,665 | 9,871 | 1,905 | 117 | 676 | 229 | | | |
| Siskiyou | 36,638 | 15,035 | 37,340 | | | | | | |
| Total: 1956 | 261,029 | 50,886 | 49,543 | 33,304 | 7,484 | 713,182 | 1,379,400 | 13,877,400 | 14,857,400 |
| 1955 | 293,309 | 94,708 | 83,150 | 30,010 | 9,376 | 663,466 | 1,160,900 | 13,327,700 | 13,213,900 |
| **BY CLASSES OF MATERIAL TREATED** | | | | | | | | | |
| Dry gold: Crude ore | 90,044 | 50,886 | 49,543 | 350 | 6,009 | 9,329 | 300 | 10,800 | 3,600 |
| Dry gold-silver: Crude ore | 70 | | | 7 | 73 | 1,152 | | | |
| Copper: Crude ore and tungsten ore [3] [4] | 11,882 | | | 2,090 | 325 | 89,820 | 1,027,000 | 7,000 | |
| Lead: Crude ore | 5 | | | 1 | | 33 | | 100 | |
| Lead-zinc: Crude ore | 159,028 | | | 30,856 | 1,077 | 612,848 | 352,100 | 13,859,500 | 14,853,800 |
| Total 1956 | 261,029 | 50,886 | 49,543 | 33,304 | 7,484 | 713,182 | 1,379,400 | 13,877,400 | 14,857,400 |
| **BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]** | | | | | | | | | |
| Dry gold | | | | 320 | 5,954 | 9,299 | 300 | 10,800 | 3,600 |
| Dry gold-silver | | | | 7 | 73 | 1,152 | | | |
| Copper | | | | [4] 2,086 | [4] 325 | [4] 89,820 | [4] 1,022,000 | 7,000 | |
| Lead | | | | 14,890 | 512 | 509,429 | 230,600 | 10,798,100 | 1,514,800 |
| Lead-zinc | | | | 3,708 | 507 | 51,272 | 17,100 | 2,434,300 | 441,100 |
| Zinc | | | | 12,259 | 58 | 52,180 | 104,400 | 627,200 | 12,897,900 |
| Cement copper | | | | 4 | | | 5,000 | | |
| Pyrite | | | | 30 | 55 | 30 | | | |
| Total 1956 | | | | 33,304 | 7,484 | 713,182 | 1,379,400 | 13,877,400 | 14,857,400 |

Digitized by Google

**TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued**

*B. For material shipped directly to smelters*

| | Material shipped (short tons) | Recoverable metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | |
| Calaveras, Del Norte, and Humboldt [2] | 399 | 21 | 344 | 56, 100 | | |
| Imperial, Mono, and Plumas [2] | 55 | 56 | 79 | 1, 500 | | |
| Inyo | 16, 618 | 486 | 158, 765 | 151, 800 | 4, 663, 800 | 1, 191, 000 |
| Kern | 667 | 245 | 4, 612 | | | |
| Mariposa | 25 | 14 | 11 | 500 | | |
| Riverside | 143 | | 225 | 2, 700 | | |
| San Bernardino | 1, 778 | 134 | 2, 518 | 92, 100 | 34, 500 | 8, 800 |
| Shasta, Trinity, and Tuolumne [2] | 388 | 43 | 1, 540 | 33, 900 | 16, 300 | 40, 800 |
| Total: 1956 | 20, 073 | 999 | 168, 094 | 338, 600 | 4, 714, 600 | 1, 240, 600 |
| 1955 | 11, 210 | 1, 040 | 199, 840 | 65, 100 | 3, 202, 300 | 458, 100 |
| **BY CLASSES OF MATERIAL** | | | | | | |
| Dry gold: Crude ore | 146 | 167 | 230 | 3, 100 | | |
| Dry gold-silver: Crude ore | 667 | 245 | 4, 612 | | | |
| Dry silver: Crude ore | 168 | | 335 | 2, 100 | | |
| Copper: Crude ore and flue dust [2] | 3, 167 | 102 | 3, 625 | 264, 000 | 12, 700 | 40, 200 |
| Lead: Crude ore and flue dust [2] | 5, 294 | 115 | 94, 376 | 15, 000 | 2, 659, 700 | 217, 500 |
| Lead-zinc: Crude ore | 10, 555 | 368 | 63, 933 | 54, 300 | 2, 039, 300 | 976, 500 |
| Zinc: Crude ore | 76 | 2 | 983 | 100 | 2, 900 | 6, 400 |
| Total 1956 | 20, 073 | 999 | 168, 094 | 338, 600 | 4, 714, 600 | 1, 240, 600 |

[1] Excludes concentrate treated only by amalgamation and/or cyanidation.
[2] Combined to avoid disclosing individual company confidential data.
[3] Tungsten ore tonnage not included with material treated.
[4] Includes concentrate and contained recoverable metal from tungsten ore.

**TABLE 17.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content**

| Class of material | Quantity shipped or treated (short tons) | Gross metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **CONCENTRATE SHIPPED TO SMELTERS** | | | | | | |
| Dry gold | 320 | 5, 954 | 9, 299 | 397 | 10, 921 | 4, 623 |
| Dry gold-silver | 7 | 73 | 1, 152 | 4 | 22 | |
| Copper | [1] 2, 086 | [1] 325 | [1] 89, 825 | [1] 1, 046, 140 | 12, 801 | 125, 850 |
| Lead | 14, 890 | 512 | 500, 429 | 271, 585 | 10, 985, 269 | 1, 917, 541 |
| Lead-zinc | 3, 708 | 507 | 51, 272 | 20, 084 | 2, 476, 416 | 558, 292 |
| Zinc | 12, 259 | 58 | 52, 180 | 106, 693 | 660, 174 | 13, 201, 895 |
| Cement copper | 4 | | | 5, 191 | 15 | |
| Pyrite | 30 | 55 | 30 | 1 | 5 | 45 |
| Total: 1956 | 33, 304 | 7, 484 | 713, 187 | 1, 450, 095 | 14, 145, 623 | 15, 808, 246 |
| 1955 | 30, 010 | 9, 376 | 663, 466 | 1, 214, 039 | 13, 589, 628 | 13, 950, 697 |
| **ORE, ETC., SHIPPED DIRECTLY TO SMELTERS** | | | | | | |
| Dry gold: Crude ore | 146 | 167 | 230 | 3, 433 | 17 | 60 |
| Dry gold-silver: Crude ore | 667 | 245 | 4, 612 | | | |
| Dry silver: Crude ore | 168 | | 335 | 2, 200 | | |
| Copper: Crude ore and flue dust [2] | 3, 167 | 102 | 3, 633 | 272, 932 | 13, 121 | 50, 872 |
| Lead: Crude ore and flue dust [2] | 5, 294 | 115 | 94, 376 | 18, 060 | 2, 722, 408 | 275, 225 |
| Lead-zinc: Crude ore | 10, 555 | 368 | 63, 933 | 70, 006 | 2, 068, 677 | 1, 235, 948 |
| Zinc: Crude ore | 76 | 2 | 983 | 192 | 2, 971 | 8, 061 |
| Total: 1956 | 20, 073 | 999 | 168, 102 | 366, 823 | 4, 807, 194 | 1, 570, 166 |
| 1955 | 11, 210 | 1, 040 | 199, 910 | 71, 406 | 3, 368, 492 | 582, 374 |

[1] Includes concentrate and contained metal from tungsten ore.
[2] Combined to avoid disclosing individual company confidential data.

Digitized by Google

**TABLE 18.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals [1]**

| County and district | Mines producing [2] | | Lode material (short, tons) | Gold (fine ounces) | | | Silver (lode and placer [3] fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Lode | Placer | Total | | | | | |
| Amador County: | | | | | | | | | | | |
| East Belt [4] | | 1 | | | 26 | 26 | 4 | | | | $914 |
| West Belt [5] | 1 | 1 | (6) | (6) | 12 | [7] 12 | [7] 1 | (6) | (6) | | [7] 421 |
| Butte County: | | | | | | | | | | | |
| Butte Creek | | (8) | | | 3 | 3 | | | | | 105 |
| Forbestown | | 1 | | | 13 | 13 | 1 | | | | 456 |
| Oroville | | 3 | | | 27 | 27 | 3 | | | | 947 |
| Yankee Hill | | 3 | | | 21 | 21 | 1 | | | | 736 |
| Calaveras County: | | | | | | | | | | | |
| East Belt [4] | 2 | (8) | (6) | (6) | 9 | [7] 9 | [7] 1 | | | | [7] 316 |
| Mother Lode [9] | (8) | 1 | cleanup | 8 | (6) | [10] 8 | [10] 2 | | | | [10] 282 |
| West Belt [5] | 3 | 1 | 633 | 4 | (6) | 4 | [10] 308 | 51, 300 | | | [10] 22, 221 |
| El Dorado County: East Belt [4] | 1 | (8) | 5, 590 | 2, 651 | (6) | [10] 2, 651 | [10] 945 | | 10, 300 | 2, 700 | [10] 95, 627 |
| Inyo County: | | | | | | | | | | | |
| Deep Springs | 1 | | 50 | 2 | | 2 | 59 | 4, 700 | | | 2, 121 |
| Fish Springs | 1 | | 20 | 5 | | 5 | 218 | | 4, 700 | | 1, 110 |
| Independence (Russ) | 1 | | 20 | 3 | | 3 | 61 | 1, 500 | 300 | | 844 |
| Modoc | 2 | (8) | (6) | (6) | 2 | [7] 2 | [7] 1 | (6) | (6) | (6) | [7] 71 |
| Kern County: | | | | | | | | | | | |
| Clear Creek | 1 | | 29 | 30 | | 30 | 12 | | | | 1, 061 |
| Kern River | | (8) | | | 47 | 47 | 10 | | | | 1, 655 |
| Randsburg | 4 | 1 | 616 | 582 | (6) | [10] 582 | [10] 147 | | | | [10] 20, 503 |
| Madera County: Chowchilla River | | 1 | | | 20 | 20 | 8 | | | | 707 |
| Mariposa County: | | | | | | | | | | | |
| East Belt [4] | 2 | (8) | (6) | (6) | 2 | [7] 2 | (7) | | | | [7] 70 |
| Mother Lode | 4 | 1 | 386 | 1, 467 | (6) | [10] 1, 467 | [10] 347 | | | | [10] 51, 659 |
| Merced County: Merced River (Snelling) | | 1 | | | 27 | 27 | 3 | | | | 948 |
| Mono County: Cooney Lake | 1 | | 5 | 3 | | 3 | | | | | 105 |
| Nevada County: | | | | | | | | | | | |
| Chicago Park | | (8) | | | 4 | 4 | | | | | 140 |
| French Corral | | 3 | | | 64 | 64 | 7 | | | | 2, 246 |
| Grass Valley-Nevada City | 3 | 1 | (6) | (6) | 8 | [7] 8 | (7) | | | | [7] 280 |
| Washington-North Columbia | 2 | 2 | 210 | 84 | (6) | 84 | (10) | | | | [10] 2, 940 |
| Placer County: | | | | | | | | | | | |
| American River (Folsom) [11] | | (8) | | | 10 | 10 | 2 | | | | 352 |
| Auburn | 1 | (8) | (6) | | 19 | 19 | [7] 3 | | | | [7] 668 |
| Colfax | | (8) | | | 18 | 18 | 1 | | | | 631 |
| Dutch Flat | (8) | (6) | (6) | (6) | 35 | [7] 35 | [7] 2 | | | | [7] 1, 227 |
| Rocklin | | 2 | | | 22 | 22 | 1 | | | | 771 |
| West Belt [5] | | (8) | | | 1 | 1 | | | | | 35 |
| Plumas County: | | | | | | | | | | | |
| Granite Basin | | (8) | | | 13 | 13 | 1 | | | | 456 |
| La Porte | | (8) | | | 15 | 15 | 2 | | | | 527 |

Digitized by Google

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sacramento County: American River (Folsom)[11] | | 7 | | | 49,641 | 49,641 | 2,166 | | | | 1,739,395 |
| San Bernardino County: | | | | | | | | | | | |
| Dale | 3 | | 97 | 44 | | 44 | 148 | 2,200 | | | 2,609 |
| Spangler | 1 | | 1 | | | | 8 | | 100 | | 23 |
| Whipple Mountains | 6 | | 356 | 38 | | 38 | 41 | 13,800 | | | 7,232 |
| Shasta County: | | | | | | | | | | | |
| French Gulch | 1 | (9) | (6) | (6) | 10 | [7] 10 | [7] 4 | | | | [7] 353 |
| Redding | 1 | 1 | 6 | 2 | (6) | [10] 2 | (10) | | | | [10] 70 |
| Sierra County: | | | | | | | | | | | |
| Gibsonville | | (9) | | | 3 | 3 | | | | | 105 |
| Poverty Hill | | 1 | | | 5 | 5 | 1 | | | | 176 |
| Trinity County: | | | | | | | | | | | |
| Cinnibar | | 1 | | | 1 | 1 | | | | | 35 |
| Trinity River | 1 | 6 | (6) | (6) | 6,103 | [7] 6,103 | [7] 688 | (6) | | | [7] 214,227 |
| Tuolumne County: East Belt[4] | 3 | | 23 | 102 | | 102 | 4 | | | | 3,574 |
| Yuba County: | | | | | | | | | | | |
| Bear River | | (8) | | | 27 | 27 | 4 | | | | 949 |
| Dobbins | | (8) | | | 14 | 14 | | | | | 490 |
| Smartville | | (8) | | | 1 | 1 | | | | | 35 |
| Strawberry | | (8) | | | 6 | 6 | 1 | | | | 211 |
| Undistributed[12] | 70 | 34 | 273,060 | 54,344 | 78,218 | 132,562 | 932,923 | 1,644,500 | 18,576,600 | 16,095,300 | 11,304,507 |
| Total | 116 | 73 | 281,102 | 59,369 | 134,447 | 193,816 | 938,139 | 1,718,000 | 18,592,000 | 16,098,000 | 13,487,143 |

[1] Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts are listed in footnote 12 and their output grouped as "Undistributed."

[2] Excludes itinerant prospectors, "snipers", "high-graders," and others who gave no evidence of legal right to property.

[3] Source of total silver as follows: 930,819 ounces from lode mines and 7,320 ounces from placer mines.

[4] East Belt district lies in Amador, Calaveras, El Dorado, Mariposa, and Tuolumne Counties.

[5] West Belt district lies in Amador, Calaveras, and Placer Counties.

[6] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[7] Exclusive of lode output, which is included with "Undistributed."

[8] From property not classed as a mine.

[9] Mother Lode district lies in Calaveras and Mariposa Counties.

[10] Exclusive of placer output, which is included with "Undistributed."

[11] American River (Folsom) district lies in Placer and Sacramento Counties.

[12] Includes the following districts: Cosumnes River and Mother Lode, Amador County; French Hill, Del Norte County; Mother Lode and West Belt, El Dorado County; San Joaquin (Friant), Fresno County; Horse Mountain, Humboldt County; Cargo Muchacho, Imperial County; Bishop, Darwin (Coso), Furnace Creek (Greenwater), Lee, Le Moigne, Resting Springs (Tecopa), Sherman South Park and Ubehebe, Inyo County; Greenhorn, Mohave and Sageland, Kern County; Neenach and San Gabriel, Los Angeles County; Fresno River (Dennis) and West Belt (Daulton), Madera County; West Belt, Mariposa County; Masonic, Mono County; Graniteville-Bowman and You Bet (Little York), Nevada County; Dairy Farm, Foresthill, Iowa Hill, Last Chance, Lincoln and Ralston Divide, Placer County; Greenville, Quincy and Red Rock, Plumas County; Bendigo, Corona and Dale, Riverside County; Barstow, Clark Mountain, Fry Mountains, Ivanpah, Kingston, Morongo, Needles, Newberry, Ord Mountain, Signal, Solo and Turtle Mountain, San Bernardino County; Julian and Pine Valley, San Diego County; Cow Creek (Ingot), Flat Creek (Kennett) and Shasta, Shasta County; Alleghany, Downieville, Gold Lake, Pike (Indian Hill) and Poker Flat (Port Wine), Sierra County; Klamath River, Salmon River, Scott River and Shasta River, Siskiyou County; Stanislaus River, Stanislaus County; Hayfork and New River, Trinity County; Mother Lode, Tuolumne County, Comptonville, Challenge (Brownsville) and Yuba River, Yuba County; and "Undistributed" for various counties.

465877—58——13

Digitized by Google

**Gold.**—The 1956 gold output dropped sharply—to the lowest point since 1945. This was due largely to the narrowing margin between operating costs at the gold mines and the fixed gold price, and, more specifically, to the closing of the Empire Star group of mines in Nevada County during the year. The property was shut down during a labor strike over wages and did not reopen. Over 100 lode mines in 23 counties produced 280,000 tons of ore, which yielded nearly 60,000 ounces of gold. Eighty-six percent of this yield was recovered as bullion from amalgamation and cyanidation processes. Recoveries from smelting concentrates and ores were about 12 and 2 percent, respectively.

Placer mines contributed a large percentage of the total gold produced in the State. In 1956 placer production was 69 percent of the total yield compared with 58 percent in 1955. The quantity of placer gold recovered (from 10 percent fewer properties) was 8 percent lower than in 1955. Most of the production came from bucket-line dredging in the Trinity River (Weaverville) district, Trinity County; the American River (Folsom) district, Sacramento County; and the Yuba River district, Yuba County. Although the United States Mint at San Francisco had suspended making coinage in March 1955, it continued to be a principal depository of gold and silver bullion produced in California during 1956. The American Smelting and Refining Co. gold and silver refinery at Selby also received noteworthy shipments of bullion. The following leading gold producers supplied most of the State's total output: Natomas Co., Sacramento County (dredging); Yuba Consolidated Gold Fields, Yuba County (dredging); Empire Star Mines Co., Ltd., Nevada County (gold ore); and Siskon Corp., Siskiyou County (gold ore).

**Iron Ore.**—California iron-ore production in 1956, from two counties, was a direct reflection of the increased demand by western industry for steel products. The mine output at the Eagle Mountain mine of the Kaiser Steel Corp., Riverside County, was up over 40 percent compared with 1955. In addition to supplying the needs of the company Fontana steel plant, approximately 150,000 tons of ore was shipped for export—an increase of more than 100 percent over the preceding year. Although the average grade of mine-run ore was lower, the tonnage beneficiated and shipped to furnaces increased nearly 50 percent above 1955.

The iron-ore output in San Bernardino County was limited to two producers. One operator worked only during the last 2 months of the year and shipped iron ore to the Fontana blast furnaces. The other operated in December only and produced a low-grade ore that was used in a San Bernardino County plant as an additive to portland cement. The average grade of the ore shipped in the State in 1956 was 53.3 percent compared with 54.5 in 1955.

**Iron and Steel.**—Pig-iron production in California in 1956 was more than 1.4 million tons and was the product of 3 blast furnaces operated by Kaiser Steel Corp. at Fontana (San Bernardino County). The annual capacity of these furnaces was reported at 1,314,000 tons, indicating that yield was nearly 100 percent of capacity in 1956 and 17 percent greater than in 1955. Approximately 85 percent of the pig-iron output was used at the Fontana plant to make steel; the remainder was sold to Pacific coast foundries and other steel producers

Digitized by Google

and exported. The pig iron used in steelmaking by the Pittsburg and Torrance plants of Columbia-Geneva Steel Division, United States Steel Corp., was received from the company Geneva (Utah) blast furnaces.

TABLE 19.—Iron ore and other metallic materials consumed and pig iron produced, 1947–51 (average) and 1952–56, in net tons

| Year | Iron and manganiferous iron ores | | Sinter [1] | Miscellaneous | Total | Pig iron produced |
|---|---|---|---|---|---|---|
| | Domestic | Foreign | | | | |
| 1947–51 (average) | 507,434 | 1,818 | 388,886 | 92,630 | 990,768 | 563,701 |
| 1952 | 952,606 | | 612,356 | 172,227 | 1,737,189 | 977,121 |
| 1953 | 987,471 | | 805,938 | 150,504 | 1,943,913 | 1,095,118 |
| 1954 | 752,766 | | 650,609 | 134,768 | 1,538,143 | 860,162 |
| 1955 | 1,008,256 | | 800,929 | 134,358 | 1,943,543 | 1,122,091 |
| 1956 | 1,256,344 | | 1,094,319 | 110,857 | 2,461,520 | 1,409,105 |

[1] Excludes recycled materials.

The production of steel ingots and steel for castings in 1956 exceeded 3.1 million tons, 8 percent above the 1955 figure, and represented 96 percent of the capacity for all California steel plants. The active steel plants operating open-hearth furnaces during the year were: Kaiser Steel Corp., at Fontana in San Bernardino County (9 furnaces); Columbia-Geneva Steel Division, United States Steel Corp., at Pittsburg in Contra Costa County (5 furnaces) and at Torrance in Los Angeles County (4 furnaces); Bethlehem Pacific Coast Steel Corp., at South San Francisco in San Mateo County (5 furnaces); and Pacific States Steel Corp., at Niles, and Judson Steel Corp., at Emeryville, in Alameda County (3 furnaces each). Three steel companies, all in Los Angeles County, produced steel during 1956, using electric furnaces. They were: Bethlehem Pacific Coast Steel Corp. (3 furnaces) and Southwest Steel Rolling Mills (1 furnace) at Los Angeles; and National Supply Co., at Torrance (3 furnaces). The 36 furnaces at 9 plants had an annual rated capacity of 3,280,000 tons of steel ingots and castings.

**Lead.**—The quantity of lead produced in 1956 was 12 percent above 1955. The high yield was attributed principally to an average 5-percent metal-price increase for the year. Inyo County produced a very high percentage of California's entire output, and within the county the Darwin group of mines in the Darwin (Coso) district and the Shoshone group in the Resting Springs district produced most of the county total. Other production in Inyo County was from the Modoc, Lee, Ubehebe, and Fish Springs districts. The lead-zinc ores yielded the greatest quantity of lead, followed by the ores of lead, gold, copper, and zinc. The Anaconda Co. was the leading lead producer, followed by Foreman & Foreman, Modoc district; Norris & Bracken, Lee district; and Lippincott Lead Mines, Ubehebe district (all in Inyo County).

Because the second largest use for lead has been in tetraethyl lead for gasoline antiknock compounds, it was interesting to note that one new California plant began producing these compounds in 1956, and plans were announced for constructing another. American Smelting and Refining Co. operated California's only major smelter treating

Digitized by Google

primary nonferrous material at Selby (Contra Costa County). At Ontario (San Bernardino County) Lippincott Lead Co. smelted lead scrap in conjunction with lead ore from its Lippincott (Lead King) mine in Inyo County. The lead bullion was utilized locally in storage batteries.

**Manganese.**—For the fourth year the quantity of metallurgical-type manganese ore produced in California declined. Contrary to previous years, important tonnages of low-grade manganese ore were concentrated at Riverside County mills. One of these concentrators custom-milled ores from Imperial County. A high percentage of the ore and concentrate came from open-pit and underground mines in the Little Maria Mountains, Riverside County. Except for one operator in Lake County who shipped to the low-grade depot at Butte, Mont., all shipments were to Government stockpiles on the carlot program. Manganese concentrates comprised 60 percent of all shipments during the year. No low-grade ore or concentrates were shipped in 1956. California Limestone Products, in the Ironwood district of Riverside County, was California's leading shipper of manganese ore and concentrate. Aspen Mining Co., in the same district, operated California's only mill that concentrated low-grade manganese ores and was an important producer of manganese concentrate and ore from its Black Jack mine. Wm. L. Ash (Mt. Hough mine, Plumas County), Walter S. Thing (Black Point and Tadpole mines, Imperial County), and S & C Mining Co. (South Thomas mine, Mendocino County) mined and shipped appreciable tonnages of manganese ore. Activity under DMEA projects was limited to one contract executed in San Bernardino County and one contract termination in Plumas County.

**TABLE 20.—Mercury produced in 1956, by counties**

| County | Producing mines | Ore treated (short tons) | Mercury recovered | |
|---|---|---|---|---|
| | | | 76-pound flasks | Value [1] |
| Fresno | 3 | 324 | 26 | $6,758 |
| Lake | 9 | 25,778 | 2,482 | 645,121 |
| Monterey | 2 | 10 | 2 | 520 |
| San Benito | 12 | 30,029 | 2,914 | 757,407 |
| San Luis Obispo | 6 | 1,550 | 117 | 30,411 |
| San Mateo | 1 | 6,766 | 532 | 138,277 |
| Santa Clara | 3 | 6,676 | 1,905 | 495,148 |
| Trinity | 3 | 62 | 10 | 2,599 |
| Undistributed [2] | 32 | 14,918 | 1,029 | 267,458 |
| Total | 71 | 86,113 | [3] 9,017 | 2,343,699 |

[1] Value calculated at average price at New York—$259.92 per flask.
[2] Includes Del Norte, Kings, Marin, Merced, Napa, San Bernardino, Santa Barbara, Sonoma, and Stanislaus Counties to avoid disclosing individual company confidential data.
[3] Includes mercury from dump and placer material treated.

**Mercury.**—The production of mercury in 1956 continued the decline begun the preceding year, in spite of an increase of 31 operators and 22 producing operations. Only 13 producers in 6 counties reported a yield for the year of 100 or more flasks. Over 50 percent of California's mercury operations yielded less than 10 flasks each for the entire year. Despite these circumstances, in 1956 California produced

Digitized by Google

**TABLE 21.—Mercury produced, 1947–51 (average) and 1952–56, by methods of recovery**

| Year | Furnaced [1] | | Retorted | | Unclassified [2] | Total | | Operating mines |
|---|---|---|---|---|---|---|---|---|
| | Ore (short tons) | 76-pound flasks | Ore (short tons) | 76-pound flasks | 76-pound flasks | 76-pound flasks | Value [3] | |
| 1947–51 (average) | 62,785 | 7,641 | 603 | 254 | 300 | 8,195 | $772,562 | 19 |
| 1952 | 82,431 | 6,992 | 1,239 | 202 | 47 | 7,241 | 1,441,683 | 24 |
| 1953 | 95,325 | 8,874 | 1,556 | 343 | 73 | 9,290 | 1,793,249 | 28 |
| 1954 | 110,445 | 10,525 | 10,100 | 724 | 13 | 11,262 | 2,977,560 | 35 |
| 1955 | 122,937 | 8,671 | 5,982 | 1,077 | 127 | 9,875 | 2,867,206 | 49 |
| 1956 | 76,801 | 6,991 | 9,312 | 1,971 | 55 | 9,017 | 2,343,699 | 71 |

[1] Includes ore and mercury from dumps not separable.
[2] Includes mercury recovered from miscellaneous dump material, placer, and cleanup operations.
[3] Value calculated at average price at New York.

37 percent of the domestic mercury. Three counties (Lake, San Benito, and Santa Clara) furnished over 80 percent of the State's entire production. The major mercury producers in 1956 were: New Idria Mining & Chemical Co., Idria district, San Benito County; and California Quicksilver Mines, Inc., Sulfur Springs district, and Bradley Mining Co., Mayacmas district, both in Lake County. Activity under DMEA projects continued high during the year. Out of 10 contracts for exploration and development of mercury deposits in effect, only 2 (1 each in Lake and Napa Counties) were terminated.

**Molybdenum.**—California's entire output of molybdenum concentrates was produced by an operator in the Pine Creek area, Inyo County. Molybdenite and powellite concentrates were recovered as byproducts in the treatment of tungsten ores. The concentrates were sold for export.

**Platinum.**—The quantity of platinum recovered as a byproduct from gold dredging in Sacramento and Yuba Counties was only slightly over half that in the preceding year. Most of the 1956 production came from the Yuba River district (Yuba County).

**Rare-Earth Metals.**—California's output of rare-earth minerals in 1956 originated in the Molybdenum Corp. of America open-pit mine in northeastern San Bernardino County. The deposit adjoins U. S. Highway 91 in the Mountain Pass area. The mined ore contained about 10 percent of rare earths and 25 percent of barite. Bastnaesite—a fluocarbonate of the cerium subgroup of the rare-earth metals—was recovered by flotation as a concentrate containing about 60 percent rare-earth oxides. Part of the concentrates received further treatment by acid leaching and roasting to produce a concentrate containing above 90 percent of rare-earth oxides. Shipments of both grades of concentrates were made to consumers, part going to the Pennsylvania plant of the company for further treatment and basic research on extraction of the rare-earth elements. Production exceeded shipments, and stocks at year's end were appreciable. The barite tailings from the flotation process have been impounded, awaiting a possible future market.

**Silver.**—The quantity of silver produced in 1956 dropped less than 2 percent below that in 1955, largely because of the increased activity in lead- and zinc-ore production, from which silver was a byproduct metal. Inyo County was the source of 91 percent of the State total,

Digitized by Google

most of which came from the lead-zinc ores of mines in the Darwin (Coso) and Resting Springs districts and the tungsten ore of the Bishop district. Less than 1 percent was produced by placer mines as the coproduct of gold. Output was supplied by 148 lode mines and 64 placer mines in 29 counties. The major silver producers, both in Inyo County, were The Anaconda Co., Darwin (Coso) district (lead-zinc ore); and Union Carbide Nuclear Co., Bishop district (tungsten ore).

**TABLE 22.—A. Tungsten concentrates produced in 1956, by counties in which ore was milled**

| County | Producing mines and prospects | Ore [1] | | | Concentrates produced [1] (pounds) | Contained $WO_3$ [1] (units) |
|---|---|---|---|---|---|---|
| | | Mined (short tons) | To mills (short tons) | Milled [2] (short tons) | | |
| Alpine | 5 | 555 | 555 | | | |
| Calaveras | 1 | 20 | 20 | 20 | 225 | 7 |
| El Dorado | 2 | (3) | (3) | (3) | (3) | (3) |
| Fresno | 13 | 5,922 | 5,922 | 6,005 | 51,906 | 1,701 |
| Inyo | 54 | 274,285 | 276,933 | [4] 278,533 | [4] 4,276,811 | [4] 152,106 |
| Kern | 45 | 5,862 | 4,913 | 4,189 | 53,413 | 1,695 |
| Los Angeles | | | | 460 | 4,880 | 151 |
| Madera | 8 | 16,433 | 16,433 | 15,942 | 158,489 | 5,617 |
| Mariposa | 8 | 279 | 279 | 781 | 6,727 | 230 |
| Mono | 10 | 166,046 | 168,287 | 167,675 | 2,102,812 | 65,912 |
| Nevada | 1 | (3) | (3) | (3) | (3) | (3) |
| Placer | 1 | (3) | (3) | (3) | (3) | (3) |
| Riverside | 5 | 71 | 71 | 11 | 122 | 4 |
| San Bernardino | 21 | 49,229 | 49,229 | 49,759 | 516,505 | 16,450 |
| San Diego | 3 | 1,196 | 1,196 | 943 | 10,189 | 330 |
| Tulare | 34 | 28,101 | 28,091 | 28,060 | 232,368 | 7,319 |
| Tuolumne | 1 | (3) | (3) | (3) | (3) | (3) |
| Undistributed [5] | | 12,607 | 12,607 | 12,028 | 112,480 | 4,303 |
| Total | 212 | 560,606 | 564,536 | 564,406 | 7,526,927 | 255,825 |

**B.—Production and shipments of tungsten concentrates in 1956 credited to California counties in which ore was mined**

| County | Concentrates | | | | |
|---|---|---|---|---|---|
| | Produced [1] | | Shipped | | |
| | Pounds | Units | Pounds | Contained $WO_3$ Units | Value [2] |
| Alpine | 20,245 | 661 | 20,245 | 661 | $36,990 |
| Calaveras | 225 | 7 | 225 | 7 | 432 |
| Fresno | 51,016 | 1,672 | 51,016 | 1,672 | 97,142 |
| Inyo | 4,259,858 | 151,573 | 3,500,174 | 124,283 | 7,556,340 |
| Kern | 59,618 | 1,888 | 59,618 | 1,888 | 114,342 |
| Madera | 161,731 | 5,733 | 161,731 | 5,733 | 321,347 |
| Mariposa | 3,342 | 110 | 3,342 | 110 | 6,870 |
| Mono | 2,110,454 | 66,142 | 1,894,948 | 60,049 | 3,614,814 |
| Riverside | 706 | 23 | 706 | 23 | 1,399 |
| San Bernardino | 512,262 | 16,320 | 517,508 | 16,496 | 977,837 |
| San Diego | 12,389 | 394 | 12,389 | 394 | 22,555 |
| Tulare | 232,721 | 7,330 | 232,721 | 7,330 | 433,746 |
| Undistributed [6] | 119,124 | 4,509 | 119,124 | 4,509 | 265,564 |
| Total | 7,543,691 | 256,362 | 6,573,747 | 223,155 | 13,449,378 |

[1] Partly estimated.
[2] Ore actually milled in county, including material from other counties and States.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[4] Includes material from Nevada mines.
[5] Based on GSA values.
[6] Includes El Dorado, Nevada, Placer, and Tuolumne Counties.

Digitized by Google

**Tungsten.**—Production of tungsten concentrate in California in 1956 decreased 3 percent compared with the record high of 1955. Shipments declined 16 percent, yet the State supplied over 25 percent of the domestic output during 1956, second only to Nevada. There were 85 fewer producing mines, which reflected closing of many marginal mining operations. The purchase of tungsten concentrates by Government under the original purchase program was virtually complete by June, and available funds were exhausted in September 1956. New legislation made additional funds available in October but at a reduced unit price to major producers, who had greatly curtailed operations by the end of the year. Three counties yielded over 90 percent of the State production, and 3 mines produced 83 percent of the recovered tungsten concentrate. They were: The Pine Creek mine, Inyo County; the Black Rock mine, Mono County; and the Atolia mine, San Bernardino County. There was no new activity in tungsten exploration under the DMEA program. Three contracts in effect during 1955 continued active throughout 1956.

**Uranium.**—Uranium activity continued to be high in 1956. Ten mining companies shipped ore to concentrators in Arizona, Colorado, and Utah during the year. Operations in the Coso Range (Inyo County) and the Greenhorn Mountains (Kern County) yielded the most consistent production. A development company in Kern County operated a pilot plant intermittently near Mojave in an attempt to produce a concentrate, from ores of several deposits in the county, acceptable to Atomic Energy Commission (AEC). Available production figures for the first half of 1956 showed uranium-ore shipments by one operator each in Imperial, Inyo, Kern and San Bernardino Counties. A total of 514 tons of uranium ore, containing 1,371 pounds of $U_3O_8$, with an f. o. b. mine value at $2,156, was shipped to out-of-State processing plants during this period, representing a 60-percent-plus decrease in value below shipments in the last part of 1955.

**Zinc.**—Continued operation of the Darwin and Shoshone groups of mines in Inyo County by the Anaconda Co., aided by a high average price for zinc, lead to a production of zinc from California-mined material that was 18 percent above 1955, making 1956 the peak year since 1952. Contributing in part to this increase was the Government stockpile purchases of zinc. Additional important quantities of zinc recovered from the lead-zinc ores mined in the Lee and Modoc districts were credited to Inyo County. Flue dust from abandoned smelters of the Cow Creek district (Shasta County) treated at smelters supplied most of the remaining zinc production although several tons of the metal was recovered at smelter-fuming plants from gold and silver ores mined in the Kingston and Nipton districts (San Bernardino County), and from gold ore produced in the East Belt district (El Dorado County). Important zinc producers in 1956, other than The Anaconda Co., were: Louis Warnken, Jr., Darwin (Coso) district; Norris & Bracken, Lee district; and Foreman & Foreman, Modoc district.

**Other Metals.**—The lead and zinc concentrates produced from ores of the Darwin (Coso) district (Inyo County) contained an undetermined quantity of selenium, which was recovered at smelters outside the State.

Digitized by Google

In 1956 several occurrences of the minerals of cobalt, nickel, titanium, zirconium, and hafnium were reported in the State, but no production was recorded. Near Bagby in the Mother Lode district (Mariposa County), the presence of cobalt and nickel was noted in a complex sulfide vein mined for gold and copper. In San Diego County near Julian, cobalt-nickel minerals were found during development work, and preparations were made for a diamond-drilling program to explore the deposit.

The occurrence of zirconium-hafnium minerals in an open pit near Mojave (Kern County) was reported, and the ore body was blocked out. No ore has been mined owing to the lack of processing facilities that could yield a competitive product in the present market. A placer operation for gold and silver near Rocklin, Placer County, reported the presence in the gravel of zirconium and titanium minerals in varying amounts, but no immediate recovery thereof was contemplated.

## SECONDARY METALS

**Iron and Steel Scrap.**—The total tonnage of ferrous scrap consumed in California in 1956 was slightly higher than in 1955. Consumption by the 9 steel plants in the State took 84 percent of the total and was slightly above 1955. Although the California production of steel ingots and steel for castings in 1956 was 8 percent greater than in 1955, the scrap consumption by the steel industry in 1956 was only 3 percent greater than 1955. The ratio of scrap consumption to the production of steel ingots and steel for castings was 0.78 in 1955 and 0.74 in 1956. Scrap consumption by the iron and steel foundries was 15 percent of the total and 9 percent less than in 1955. Consumption of scrap by the three blast furnaces in the State was negligible. Miscellaneous consumption was 1 percent of the total and 27 percent below 1955. Stock of scrap held by consumers on December 31, 1956, were 8 percent higher than on December 31, 1955. Home scrap produced and purchased scrap received in the State during 1956 was 42 and 63 percent, respectively, of the total scrap consumed, compared with 40 and 65 percent during 1955.

**TABLE 23.—Consumption of ferrous scrap and pig iron, 1947–51 (average) and 1952–56, in short tons**

| Year | Total scrap used | Pig iron used | Year | Total scrap used | Pig iron used |
|---|---|---|---|---|---|
| 1947–51 (average) | 2,133,772 | 828,664 | 1954 | 2,185,451 | 1,000,576 |
| 1952 | 2,470,169 | 1,288,561 | 1955 | 2,777,589 | 1,223,264 |
| 1953 | 2,574,840 | 1,233,898 | 1956 | 2,789,406 | 1,430,737 |

**Nonferrous-Metal Scrap.**—It is estimated that interstate shipments of nonferrous scrap from California in 1956 totaled 90,000 tons and that approximately 12,000 tons were received in the State, from most of the Western States and the Territory of Hawaii. The Federated Metals Division of American Smelting and Refining Co. operated large remelt plants in the Los Angeles and San Francisco areas, the source locations of most of California's nonferrous-scrap supply. The com-

Digitized by Google

**TABLE 24.—Consumption of ferrous scrap and pig iron in 1955–56, by types of furnaces and miscellaneous uses, in short tons**

| Ferrous scrap and pig iron charged to— | 1955 | 1956 | Ferrous scrap and pig iron charged to— | 1955 | 1956 |
|---|---|---|---|---|---|
| Steel furnaces: [1] | | | Miscellaneous uses: Scrap [3] | 55,735 | 40,476 |
| Scrap | 2,264,324 | 2,331,570 | Total scrap | 2,777,589 | 2,789,406 |
| Pig iron | 1,026,216 | 1,242,812 | Total pig iron | 1,223,264 | 1,430,737 |
| Total | 3,290,540 | 3,574,382 | Grand total | 4,000,853 | 4,220,143 |
| Iron furnaces: [2] | | | | | |
| Scrap | 457,530 | 417,360 | | | |
| Pig iron | 197,048 | 187,925 | | | |
| Total | 654,578 | 605,285 | | | |

[1] Includes open-hearth and electric furnaces.
[2] Includes cupola, air, and blast furnaces; also direct castings.
[3] Includes rerolling, copper precipitation, nonferrous, and chemical uses.

pany purchased scrap for reshipment to other division plants and for export.

Aluminum scrap was shipped to Los Angeles; copper scrap to Tacoma, Wash.; and magnesium scrap to Houston, Tex. The Selby smelter (Contra Costa County), handled all lead scrap, including special forms and battery plates. In 1956 the San Francisco remelt plant purchased about 20,000 tons of all nonferrous metals; an approximately equal tonnage was handled at the Los Angeles plant. Probably 90 percent of the scrap tonnages at both plants originated in California. The only other major plant, a brass-remelt operation, handling nonferrous scrap, was H. Kramer & Co. in El Segundo (Los Angeles County).

## NONMETALS

**Asbestos.**—Although the quantity of asbestos mined in California in 1956 rose very slightly above 1955 the tonnage shipped dropped over 70 percent. The value of the shipments was less than half that in the previous year because of the relative quantities of amphibole and chrysotile asbestos shipped in each of the 2 years. An Inyo County operator mined amphibole material at an open pit near Lone Pine and imported Canadian short-fiber asbestos for milling. Near Monticello Dam (Napa County) one company produced chrysolite asbestos from open pit and milled the material for use as a cement additive.

A very small quantity of amphibole asbestos was mined near Iowa Hill (Placer County) and shipped to an east coast processor. In Shasta County near Redding a few tons of amphibole material was mined, but no shipment was made. One southern California processor received several hundred tons of short-fiber asbestos from Arizona producers and milled the material for resale to various consumers. Considerable interest was displayed in California asbestos deposits during the year; however, shipments from out-of-State producers and imports have effectively curtailed full development of this segment of the mining industry.

**Barite.**—Although the mine production of crude barite in 1956 was less than one-tenth that in the previous year, the quantity sold and used from stocks, previously mined, was appreciable. Major California production during the year was from an open pit in Tulare

Digitized by Google

County. This company shipped crude barite to its grinding plant in Kern County, where it was prepared for use in glass and well-drilling muds. A small tonnage of barite was mined in Inyo County and shipped to grinding plants in Los Angeles for use in well-drilling mud. A grinding plant in Stanislaus County was supplied with crude barite from the company properties in Nevada; it prepared the material for use in manufacturing barium chemicals, principally oxides and hydrates. One company operated grinding plants in Mariposa and Merced Counties and received crude barite from its pits in Mariposa and Nevada Counties, and the State of Nevada. Other grinding plants in Alameda, Fresno, and Los Angeles Counties ground crude barite received from out-of-state mines. The output of ground barite, produced for all uses, was only slightly below that in 1955. The demand in California has been steady for the past 2 years.

**Boron Minerals.**—The Nation's entire supply of boron minerals in 1956 was obtained from the bedded deposits of kernite and borax (tincal) near Boron, Kern County, and the brines of Searles Lake, San Bernardino County, except for a few tons of colemanite (natural calcium borate) mined near Death Valley Junction, Inyo County. The 1956 output was produced by three firms, namely: United States Borax & Chemical Corp. (formerly Pacific Coast Borax Co.), with refineries in Kern and Los Angeles Counties, and American Potash & Chemical Corp. and West End Chemical Division of Stauffer Chemical Co., in San Bernardino County.

Marketable compounds produced at the refineries included borax (decahydrate and pentahydrate), anhydrous sodium tetraborate, boric acid, sodium pentaborate, sodium-calcium borate, and various weed-killing and soap products. The demand for boron minerals was about the same as in 1955 and showed a quantity increase of only 2 percent. The 17-percent increase in value was attributed to higher wage and material costs in 1956.

**Bromine.**—The output of elemental bromine, produced from well brines in San Bernardino County, increased in 1956 owing to rising demand in the motor-fuel and fumigant industries. The liquid bromine was shipped to the Los Angeles area and used in producing ethylene dibromide (a constituent of high-octane motor fuel and soil fumigants), methyl bromide (a space fumigant), and dibromo chloropropane (a constituent of a soil fumigant). Ethylene dibromide was also produced as a byproduct in the processing of salt-works bitterns at a plant in Alameda County.

**Calcium Chloride.**—All of California's 1956 calcium chloride production was derived from the dry-lake brines of the Bristol Lake area near Amboy (San Bernardino County). California Salt Co. and National Chloride Co. of America produced liquid calcium chloride. Hill Bros. Chemical Co. prepared a flake product from the liquid chloride. The increased output of the liquid compound was credited to an increased demand resulting from expanded use in cement manufacturing. The calcium chloride is added to reduce the alkalinity of the lime used in the cement product, when required.

**Cement.**—Increased cement production in 1956 was due to the growing demands of the construction industry. Production, shipments, and value set new alltime records. Three California companies completed expansion programs during the year, which increased their

Digitized by Google

1956 output. One company in Kern County completed a new plant late in 1955 and was in full production during 1956. Two companies (one each in Santa Clara and Kern Counties) had expansion programs under way that will be completed early in 1957; and a third (in San Bernardino County) will have a new plant in operation by the end of the first quarter of 1957.

The impact of the Federal Highway Program on the cement industry has not yet been felt. The 1956 productions figures indicate that the slump in private dwelling construction has been offset by other construction requirements. The per unit value for cement increased in 1956, largely because of higher labor costs.

**TABLE 25.—Finished portland cement produced, shipped, and in stock, and estimated consumption, 1947–51 (average) and 1952–56**

| Year | Active plants | Estimated capacity (thousand barrels) | Production (thousand barrels) | Shipments from mills | | | Estimated consumption (thousand barrels) | Stocks at mills Dec. 31 (thousand barrels) |
|---|---|---|---|---|---|---|---|---|
| | | | | Thousand barrels | Value | | | |
| | | | | | Total | Average per barrel | | |
| 1947–51 (average) | 11 | 30,393 | 25,360 | 25,170 | $60,952,000 | $2.42 | 21,702 | 1,073 |
| 1952 | 11 | 35,120 | 29,585 | 29,786 | 79,458,000 | 2.67 | 25,361 | 1,575 |
| 1953 | 11 | 35,220 | 32,145 | 32,002 | 90,873,000 | 2.84 | 27,733 | 1,708 |
| 1954 | 11 | 35,845 | 32,599 | 32,762 | 98,251,000 | 3.00 | 28,761 | 1,563 |
| 1955 | 11 | 37,173 | 35,450 | 35,084 | 103,804,000 | 2.96 | 31,643 | 1,929 |
| 1956 | 12 | 43,582 | 39,547 | 39,290 | 120,511,000 | 3.05 | 35,856 | 2,184 |

**TABLE 26.—Production, shipments from mills, and stocks at mills of finished portland cement in 1956, by months, in thousand barrels**

| Month | Mill production | Mill shipments | Shipments to California [1] | Stocks at mills (end of month) |
|---|---|---|---|---|
| January | 2,723 | 2,432 | 2,193 | 2,219 |
| February | 2,820 | 2,901 | 2,704 | 2,137 |
| March | 3,397 | 3,721 | 3,229 | 1,814 |
| April | 3,404 | 3,126 | 2,827 | 2,091 |
| May | 3,557 | 3,555 | 3,194 | 2,094 |
| June | 3,294 | 3,480 | 3,118 | 1,908 |
| July | 3,331 | 3,537 | 3,179 | 1,702 |
| August | 3,640 | 3,770 | 3,460 | 1,572 |
| September | 3,594 | 3,295 | 2,993 | 1,871 |
| October | 3,509 | 3,719 | 3,405 | 1,661 |
| November | 3,220 | 3,113 | 2,883 | 1,768 |
| December | 3,058 | 2,641 | 2,447 | 2,184 |

[1] Includes interstate and intrastate shipments.

**Clays.**—The total tonnage of clays produced in 1956 was 4 percent greater than in 1955; the value was 22 percent greater. About 80 percent of the total output was used directly by the producers, and the remainder was sold to various processors. The manufacture of heavy clay products (brick, drain tile, sewage pipe, and kindred products) consumed 52 percent of the total, cement 26 percent, and lightweight aggregate 16 percent; the remaining 6 percent was variously consumed. There was a minor output of ball-type clay in 1956. Similar clay was produced in 1955 and classified as kaolin. The production of

Digitized by Google

fire clay increased 50 percent and clay used for cement manufacture was 7 percent greater than in 1955. The output of kaolin declined 51 percent, bentonite 8 percent, fuller's earth 38 percent, and miscellaneous clay 3 percent from 1955.

The sources of the clays produced were: 48 percent of the clays used in heavy clay products from Los Angeles and Riverside Counties—the remainder from 19 other counties; 75 percent of the clays used in cement manufacture from Calaveras, San Mateo, and Riverside Counties—the remainder from Kern, San Benito, San Bernardino, Santa Clara, and Santa Cruz Counties; 85 percent of the clays bloated for lightweight aggregate from Solano and Ventura Counties—the remainder from Amador and Yuba Counties; 85 percent of the clays used in manufacturing refractories from Amador County—the remainder from Alameda, Orange, and Riverside Counties; 96 percent of the clays used in drilling mud from Kern County—the remainder from Ventura County; 95 percent of the clays used in floor-tile manufacture from San Bernardino County—the remainder from Riverside County; and 69 percent of the clays used in pottery and stoneware manufacture from Kern and Riverside Counties—the remainder from 5 other counties. The clays used for filter and filler purposes came from deposits in Kern, Inyo, Los Angeles, and Mono Counties.

The leading clay producers in 1956 were: Gladding, McBean & Co., Davidson Brick Co., and Pacific Clay Products Co. (for heavy clay products); Calaveras Cement Co., Ideal Cement Co., and Riverside Cement Co. (for cement); Basalt Rock Co., Gladding, McBean & Co., and Rocklite Products, Inc. (for lightweight aggregate); Elsinore Clay Co., Gladding, McBean & Co., and Western Refractories Co. (for refractories); Macco Corp., McKittrick Mud Co., and Mojave

**TABLE 27.—Clays produced in 1955–56, by counties**

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Alameda | 44,032 | $29,144 | (1) | (1) |
| Amador | 180,173 | 606,943 | 235,830 | $764,963 |
| Calaveras | 123,130 | 152,400 | 173,643 | 228,580 |
| Contra Costa | 74,145 | 101,145 | 75,621 | 116,100 |
| Humboldt | 284 | 71 | ---------- | ---------- |
| Imperial | 1,613 | 11,265 | ---------- | ---------- |
| Inyo | 15,125 | 85,818 | 9,894 | 57,499 |
| Kern | 124,136 | 533,936 | 130,986 | 309,754 |
| Los Angeles | 586,811 | 641,734 | 475,528 | 593,144 |
| Mono | 2,042 | 10,210 | (1) | (1) |
| Orange | 41,918 | 155,885 | 49,210 | 197,180 |
| Riverside | 385,456 | 785,503 | 461,275 | 1,164,210 |
| San Benito | ---------- | ---------- | (1) | (1) |
| San Bernardino | 102,935 | 362,399 | 46,541 | 218,808 |
| San Diego | 22,070 | 22,070 | 40,885 | 40,885 |
| San Joaquin | 8,132 | 13,556 | 35,331 | 44,164 |
| Santa Barbara | (1) | (1) | 9,982 | 9,982 |
| Stanislaus | 4,267 | 15,989 | 3,937 | 12,795 |
| Tulare | 6,210 | 6,210 | 7,600 | 9,500 |
| Ventura | 113,768 | 145,116 | (1) | (1) |
| Undistributed [1] | 1,024,148 | 1,347,987 | 1,225,332 | 2,369,958 |
| Total | 2,860,395 | 5,027,381 | 2,981,595 | 6,137,617 |

[1] Alameda (1956), Fresno, Marin, Mono (1956), Placer, Sacramento, San Benito (1956), San Luis Obispo, San Mateo, Santa Barbara (1955), Santa Clara, Santa Cruz, Solano, Sonoma (1956), Sutter, Ventura (1956), and Yuba Counties included with "Undistributed" to avoid disclosing individual company confidential data.

Digitized by Google

Corp. (for drilling mud); Alberhill Coal & Clay Co., Gladding, McBean & Co., and Southern California Minerals Co. (for floor tile); American Minerals Co., Joe Deleo, and W. A. Shoeppe (for pottery and stoneware); American Minerals Co., Huntley Industrial Minerals, and Sierra Talc & Clay Co. (for filler use); and Sierra Talc & Clay Co. (for filter and decolorizing uses).

**Diatomite.**—California's major output of diatomite in 1956 was from open pits in Santa Barbara and Los Angeles Counties. In most instances the material was processed in mills at the pit sites. A lesser but important tonnage was mined in Napa County. This material, while not a true diatomaceous earth, contains an amorphous diatomaceous silica. Nearly all the Napa County production was used in cement and as an additive to concrete, to reduce segregation and bleeding.

Although the industry lists several hundred uses for diatomite, most of the production was used as a filter aid and in the manufacturing of insulation material. Other important uses that consumed part of the State production included: Filler in paper products and rubber, lightweight aggregate, extender in paint, and desiccants. The higher 1956 production followed an increased demand by sugar and insulation industries as compared with that of 1955.

The major producers of prepared diatomite were: Johns-Manville Products Corp. and Airox Co., from deposits in Santa Barbara County; and Great Lakes Carbon Corp., which operated open pits in both Santa Barbara and Los Angeles Counties.

**Feldspar.**—California feldspar production in 1956 continued to come principally from the dune-sand deposits in Monterey County, with a smaller quantity from an open pit near Kramer Junction (San Bernardino County). The very marked indicated increase in tonnage over 1955 was due to a reclassification of the crude dune material from Monterey County, rather than to an actual production rise in feldspar products. An important quantity of the crude sand was ground and upgraded by flotation to produce a product that met the feldspar requirements of several glass and ceramic-product manufacturers.

**Fluorspar.**—California reported no output of fluorspar in 1956. One operator in San Bernardino County reported stripping preparatory to open-pit mining and progress in constructing a flotation mill. Full-scale operation was expected early in 1957. California's fluorspar requirements in 1956 were met by shipments from Nevada mines and by imports.

**Gem Stones.**—Throughout the State quantities of gem minerals were produced in varying amounts. Most of the production was as agate, jasper, jade, rhodonite, quartz, obsidian, garnet, and onyx. Amethyst, benitoite, opalite, tourmaline, and topaz were found in smaller quantities, yet brought greater dollar value. Amethyst was found in Inyo County, amethyst and opalite in San Bernardino County, benitoite in San Benito County, and tourmaline and topaz in San Diego County. A high percentage of the better quality quartz crystals was obtained in Inyo, San Bernardino, and San Diego Counties. Of particular interest was the few pounds of myrickite (cinnabar-bearing chalcedony) from Lake County and the poundage of bloodstone collected in the Panamint Mountains of Inyo County.

Digitized by Google

**Gypsum.**—The tonnage of crude gypsum produced in 1956 exceeded that in 1955 by 7 percent, and the value was 4 percent greater. Imperial County was the chief producer in California, leading in both quantity and value. Kern County was second, with 31 percent of the tonnage and 23 percent of the value. Minor production was reported from Kings, Merced, Riverside, San Luis Obispo, and Ventura Counties. Crude gypsum imported from Mexico and shipments from Nevada supplied about 20 percent of the gypsum consumed in the State.

The uses of the gypsum processed in California have been estimated as 64 percent for gypsum board and lath, 32 percent for uncalcined agricultural gypsum, 3 percent as a cement retarder (uncalcined), and 1 percent for all other uses.

The leading producer of gypsum in 1956 was the United States Gypsum Co., which operated open-pit mines at Plaster City (Imperial County) and Midland (Riverside County). H. M. Holloway, Inc., produced gypsite from the Lost Hills open pit in Kern County. The Kaiser Gypsum Co., with a wallboard and lath plant at Long Beach, Los Angeles County, and Antioch, Contra Costa County, imported crude gypsum from San Marcos Island in the Gulf of California. The Pabco Products, Inc., wallboard and lath plants, in Los Angeles and Alameda Counties, received gypsum from the company mine near Henderson, Nev. The McPhaill Gypsum Co., with an open pit at Avenal (Kings County), produced agricultural gypsum. Westvaco Mineral Products Division recovered byproduct gypsum at its sea-water magnesia plant in Alameda County.

**Iodine.**—Waste oil-well brines from the Los Angeles Basin were the source of California's (and the nation's) 1956 crude-iodine production. In addition to the crude product, Deep Water Chemical Co., Ltd., and Dow Chemical Co., produced iodide salts. The output of both the crude and the salts increased over 1955 owing primarily to a favorable combination of raw-material supply, lack of maintenance difficulties, and a generally good production experience at the Los Angeles plants of two companies.

**Iron Oxide Pigments.**—A small tonnage of natural iron oxide pigments was produced by an Alameda County manufacturer from limonite obtained in the Columbia River area (Oregon). This company also produced a moderate quantity of synthetic iron oxide pigment from mild-steel scrap, sulfuric acid, and caustic soda.

**Lime.**—California's 1956 lime production increased above that in 1955. Lime was consumed primarily by chemical and metallurgical plants and in refractories. Demand for hydrated quicklime remained on a par with that in 1955. Over half the quicklime output was utilized on plants producing magnesium compounds from sea water. Utilization of quicklime in the building trades showed the only important decline and was due to substitution of magnesia and cement plasters for lime plaster. As in 1955, only a token quantity of lime was consumed by agriculture.

**Lithium.**—American Potash & Chemical Corp. continued to produce lithium carbonate from the Searles Lake brines in San Bernardino County. Burkeite was obtained through evaporation and fractional crystalization of the brines and dilithium-sodium phosphate was separated by flotation and treated with sulfuric acid. Sodium car-

Digitized by Google

bonate was added, precipitating the lithium carbonate. Recovery of lithium at Searles Lake was begun in 1938, and production of the carbonate product has increased steadily since that date.

**Magnesite and Magnesium Compounds.**—A small tonnage of magnesite was mined at Red Mountain (Santa Clara County) in 1956. The raw material was utilized by an Alameda County producer of hydrous magnesium sulfate. Magnesite production continued the decline begun in 1955. Competition from magnesia produced from sea water has brought about this decline. The 1956 output was less than half that in 1955.

California continued to be an important domestic supplier of magnesium compounds in 1956. Although some magnesium compounds decreased in quantity, the tonnages of refractory magnesia, and caustic-calcined magnesia used in the cement, paper, and chemical industries increased appreciably. The total output for all magnesium compounds was 14 percent above 1955. Plants in Alameda, Monterey, San Diego, and San Mateo Counties used raw sea water, sea-water bitterns, and dolomite (from quarries in Monterey and San Benito Counties) as the basic raw materials to produce various magnesium compounds.

**Mica.**—Imperial County produced all of California's mica during 1956 from two open pits. Sericite schist from one pit was wet-ground at a nearby plant and the finished product shipped for use in paint. Mica schist produced at the other pit was processed by the producer and used in manufacturing roofing paper. Crude scrap mica from South Dakota, South Africa, and India was processed at a plant in Los Angeles County for use by the roofing industry and in paint. During the year new equipment was installed to meet an increased demand by manufacturers of shingles and roofing paper.

**Perlite.**—During 1956 crude perlite was mined from deposits in Inyo, Napa, and San Bernardino Counties. The crude material from Inyo County was shipped to a plant in Los Angeles. Perlite production at a Napa County deposit was expanded in a plant operated at the quarry site. Although expansion plants were operated in Contra Costa, Fresno, Marin, Napa, Riverside, San Bernardino, and San Diego Counties nearly 80 percent of all crude perlite processed in California was treated at plants in the Los Angeles area. Nevada mines were the source of a considerable quantity of the crude mineral expanded at these plants. Most of the expanded material was utilized in plaster aggregate, and the decline in production was due primarily to substitution of sheet rock and similar products for custom plastering at tract home projects. Near the end of the year one Los Angeles plant leased a structure to increase its plant and warehousing facilities.

**Potassium Salts.**—The production of potassium salts in California in 1956 continued to be confined principally to one plant in San Bernardino County. The output of the plant was primarily muriate of potash, with about 10-percent conversion to potassium sulfate. The muriate (being comparatively free of calcium and magnesium salts) was in demand for conversion to potassium hydroxide. The production of potassium chloride has been rather stable for several years. The Commercial grade has been utilized by the fertilizer industry and the Chemical-grade muriate has been consumed by the

Digitized by Google

chemical industry in manufacturing other potassium compounds. Because of the potassium content, some flue-dust accumulations at cement plants in Contra Costa and Santa Cruz Counties were utilized in plant-food preparations. The material has had rather limited agricultural use.

**Pumice and Volcanic Cinder.**—The total production of pumice and volcanic cinder declined about 20 percent from 1955. A 12-percent increase in the output of pumice (due primarily to greater demand for use as concrete aggregate) was more than offset by a 26-percent drop in the tonnage of volcanic cinder quarried during the year. The chief reason for the decline in volcanic cinder production was the marked drop in demand for its use in surfacing roads, highways, and airstrips by Federal, State, and county agencies. Eighteen open pits in 10 counties supplied the 1956 output of pumice—56 percent of which was used as concrete aggregate, 24 percent in abrasives, 8 percent in road ballast and fill, 6 percent as a carrier for insecticides, and the remaining 6 percent for such purposes as soil conditioner, soundproof plaster, and as a filler in paints and absorbents. Eighty-two percent of the volcanic cinder output was used for ballast and fill; most of it was produced by railroad companies in San Bernardino and Siskiyou Counties for their own use. Fourteen percent of the volcanic-cinder production was used as concrete aggregate, and the remaining 4 percent was consumed in manufacturing soil conditioners and acoustic plasters.

**TABLE 28.—Pumice[1] sold or used in 1956, by counties**

| County | Crude | | Prepared | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Fresno | 69 | $396 | 217 | $1,545 | 286 | $1,941 |
| Imperial | 3,674 | 5,670 | 14,152 | 43,680 | 17,826 | 49,350 |
| Inyo | 3,212 | 6,424 | 105,402 | 644,115 | 108,614 | 650,539 |
| Madera | 600 | 1,350 | 6,946 | 103,557 | 7,546 | 104,907 |
| Mono | (2) | (2) | 30,358 | 494,566 | (2) | (2) |
| San Bernardino | 229 | 401 | (2) | (2) | (2) | (2) |
| Shasta | 5,233 | 15,125 | (2) | (2) | (2) | (2) |
| Siskiyou | 347,853 | 697,806 | 12,427 | 46,271 | 360,280 | 744,077 |
| Other counties[3] | 14,620 | 29,240 | 89,364 | 243,663 | 139,804 | 782,995 |
| Total | 375,490 | $756,412 | 258,866 | $1,577,397 | 634,356 | 2,333,809 |

[1] Includes pumicite and volcanic cinder.
[2] Kern, Lake, Lassen, Modoc Counties and portions of Mono, San Bernardino, and Shasta Counties included with "Other counties" to avoid disclosing individual company confidential data.

**Pyrite.**—The Hornet mine in the Iron Mountain area (Shasta County), produced all of California's pyrite in 1956. The ore was shipped to two sulfuric acid plants in Contra Costa County, and some of the resulting cinder was utilized as an ingredient in manufacturing special quick-setting cements. Production was slightly below that in 1955; but shipments were higher, and mine stockpiles were reduced appreciably.

**Salt.**—Nearly 75 percent of California salt production in 1956 was supplied by recovery from sea water in the San Francisco Bay area by solar evaporation and the vacuum-pan methods. Producers in Monterey, Orange, and San Diego Counties also recovered important

Digitized by Google

quantities of salt in this manner. Operators in Kern and San Bernardino Counties produced salt from dry lake brines. California's only producer of rock salt (in San Bernardino County), mined halite deposits by open-pit methods. The total salt production was greater than in 1955, and the increase was utilized mainly by manufacturers of chlorine, food processors, and water-softening plants. The entire output of one southern California producer was used in the water-softening plant of a large city. In 1956 California salt producers shipped to five Western States, Alaska, Hawaii, and the Pacific Island possessions and exported salt to Canada, Mexico, several Caribbean countries, the Philippine Islands, and Japan.

**Sand and Gravel.**—California again led the Nation in sand and gravel production in 1956. The output of these materials was up throughout the State, which was due in large part to the uninterrupted production in 1956 in contrast to the curtailed production in 1955 caused by the Los Angeles County building-trade strike and major floods in northern California. The requirements at the Beardsley Project (a dam construction near Strawberry, Tuolumne County), and freeway additions in Alameda, Marin, and Los Angeles Counties were responsible for a high percentage of the greater output.

A noteworthy percentage of the greatly increased tonnage produced in San Bernardino County was shipped to and utilized in the Los Angeles area. Stepped-up activity in new home construction in Merced County accounted for the high tonnage of prepared sand and gravel produced in that area. The trend toward increased use of portable preparation plants made possible greater utilization of California's widespread sand and gravel deposits. The trend has resulted in savings in transportation costs in a highly competitive industry, despite changing product requirements and has allowed the small operator to compete successfully at many isolated projects.

**TABLE 29.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Sand | | Gravel | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 16,221,852 | $13,739,220 | 21,833,079 | $18,852,430 | 38,054,931 | $32,591,650 |
| 1952 | 20,434,017 | 18,060,627 | 32,617,243 | 25,572,498 | 53,051,260 | 43,633,125 |
| 1953 | 22,129,931 | 21,232,885 | 36,299,597 | 31,991,318 | 58,429,528 | 53,224,203 |
| 1954 | 25,094,671 | 25,655,359 | 45,429,941 | 42,483,219 | 70,524,612 | 68,138,578 |
| 1955 | 25,506,919 | 26,856,865 | 39,371,729 | 39,963,495 | 64,878,648 | 66,820,360 |
| 1956 | 30,643,471 | 35,742,334 | 55,882,484 | 61,033,878 | 86,525,955 | 96,776,212 |

**Slate.**—The quantity and value of slate produced in California during the year were virtually the same as in 1955. One quarry near Kelsey (El Dorado Coutny) had no 1956 production but sold stocks of slate on hand for use as flagging. Another producer near Placerville in the same county quarried a substantial tonnage of slate, which was consumed as roofing granules and rock flour. The remaining California production came from a quarry near Mariposa (Mariposa County) and was utilized for flagging.

465877—58——14

Digitized by Google

**TABLE 30.—Sand and gravel sold or used by producers 1955–56, by commercial and Government-and-contractor operations and by uses**

| | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| **COMMERCIAL OPERATIONS** | | | | | | |
| Sand: | | | | | | |
| Glass | (1) | (1) | (1) | 692,998 | $2,040,420 | $2.94 |
| Molding | 43,018 | $168,034 | $3.91 | (1) | (1) | (1) |
| Building | 16,520,270 | 16,241,357 | .98 | 16,912,937 | 19,068,891 | 1.13 |
| Paving | 5,749,733 | 5,512,871 | .96 | 7,247,940 | 7,614,506 | 1.05 |
| Blast | (1) | (1) | (1) | 145,170 | 480,245 | 3.31 |
| Engine | 74,571 | 152,926 | 2.05 | 50,575 | 98,338 | 1.95 |
| Filter | 52,976 | 95,899 | 1.81 | 69,496 | 105,315 | 1.52 |
| Other [1] | 1,556,088 | 3,643,029 | 2.34 | 3,453,208 | 4,366,865 | 1.26 |
| Total sand | 23,996,656 | 25,814,116 | 1.07 | 28,572,324 | 33,794,780 | 1.18 |
| Gravel: | | | | | | |
| Building | 15,148,728 | 17,521,842 | 1.15 | 17,030,375 | 21,337,879 | 1.25 |
| Paving | 11,182,713 | 12,862,144 | 1.15 | 18,633,827 | 22,543,075 | 1.21 |
| Railroad ballast | 1,239,699 | 1,021,534 | .82 | 343,495 | 304,369 | .89 |
| Other | 1,521,019 | 1,713,157 | 1.13 | 9,388,547 | 7,651,486 | .81 |
| Total gravel | 29,092,159 | 33,118,677 | 1.13 | 45,396,244 | 51,836,809 | 1.14 |
| Total sand and gravel | 53,088,815 | 58,932,793 | 1.11 | 73,968,568 | 85,631,589 | 1.16 |
| **GOVERNMENT-AND-CONTRACTOR OPERATIONS [2]** | | | | | | |
| Sand: | | | | | | |
| Building | 104,378 | 113,579 | 1.09 | 810,971 | 951,811 | 1.17 |
| Paving | 1,405,885 | 929,170 | .66 | 1,260,176 | 995,743 | .79 |
| Total sand | 1,510,263 | 1,042,749 | .69 | 2,071,147 | 1,947,554 | .94 |
| Gravel: | | | | | | |
| Building | 160,886 | 170,902 | 1.06 | 824,508 | 1,382,287 | 1.62 |
| Paving | 10,118,684 | 6,673,916 | .66 | 9,661,732 | 7,864,782 | .81 |
| Total gravel | 10,279,570 | 6,844,818 | .67 | 10,486,240 | 9,197,069 | .88 |
| Total sand and gravel | 11,789,833 | 7,887,567 | .67 | 12,557,387 | 11,144,623 | .89 |
| **ALL OPERATIONS** | | | | | | |
| Sand | 25,506,919 | 26,856,865 | 1.05 | 30,643,471 | 35,742,334 | 1.17 |
| Gravel | 39,371,729 | 39,963,495 | 1.01 | 55,882,484 | 61,033,878 | 1.09 |
| Grand total | 64,878,648 | 66,820,360 | 1.02 | 86,525,955 | 96,776,212 | 1.12 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."
[2] Includes figures for State, counties, municipalities, and other Government agencies.

**Sodium Compounds.**—Although most of California's 1956 production of sodium compounds was derived from the dry lake brines of San Bernardino County, an important tonnage of soda ash and trona was recovered from dry-lake brines in Inyo County. A smaller quantity of salt cake was obtained from an underground deposit in Kern County. The overall increase in the output of these compounds (as compared with the preceding year) was due primarily to increased demand for salt cake for use in making kraft (paper) pulp. Production of natural sodium carbonate also increased during the year to meet the requirements of the glass and chemical industries. Unit prices were slightly higher because of higher labor costs.

**Stone.**—The stone industry enjoyed an appreciable increase in production in 1956 as a result of expanded activity in major construction projects. The 32-percent rise in quantity and 24-percent

Digitized by Google

**TABLE 31.—Production of sand and gravel in 1956, by counties**

| County | Short tons | Value | County | Short tons | Value |
|---|---|---|---|---|---|
| Alameda | 9,838,805 | $11,339,907 | Plumas | 120,170 | $109,243 |
| Alpine | 19,150 | 14,900 | Riverside | 1,301,577 | 1,774,864 |
| Amador | 199,942 | 621,160 | Sacramento | 3,400,325 | 3,940,478 |
| Butte | 694,127 | 767,489 | San Benito | 158,961 | 119,779 |
| Calaveras | 106,026 | 181,194 | San Bernardino | 4,436,478 | 4,462,583 |
| Colusa | 158,900 | 185,458 | San Diego | 3,231,171 | 5,375,035 |
| Contra Costa | 196,809 | 211,841 | San Francisco | 278,852 | 184,240 |
| Del Norte | 165,920 | 188,394 | San Joaquin | 2,223,007 | 2,321,680 |
| El Dorado | 187,612 | 194,234 | San Luis Obispo | 730,215 | 646,315 |
| Fresno | 997,527 | 1,170,024 | San Mateo | 187,366 | 134,539 |
| Glenn | 410,378 | 369,328 | Santa Barbara | 751,565 | 952,563 |
| Humboldt | 1,109,393 | 1,122,295 | Santa Clara | 1,499,194 | 1,216,835 |
| Imperial | 588,693 | 517,616 | Santa Cruz | 734,907 | 768,918 |
| Inyo | 164,791 | 148,830 | Shasta | 493,249 | 633,325 |
| Kern | 1,106,645 | 1,807,330 | Siskiyou | 407,384 | 519,503 |
| Kings | 17,004 | 17,420 | Sierra | 5,191 | 2,595 |
| Lake | 187,461 | 170,972 | Solano | 853,394 | 868,800 |
| Lassen | 447,183 | 463,439 | Stanislaus | 795,322 | 764,686 |
| Los Angeles | 28,904,482 | 30,807,859 | Sutter | 1,283,779 | 1,915,064 |
| Mariposa | 90,862 | 145,670 | Tehama | 184,921 | 235,088 |
| Mendocino | 536,273 | 353,948 | Trinity | 201,277 | 250,012 |
| Merced | 1,778,909 | 1,470,102 | Tulare | 559,922 | 716,186 |
| Modoc | 213,460 | 209,160 | Ventura | 2,874,826 | 3,367,855 |
| Mono | 196,320 | 169,770 | Yolo | 686,162 | 632,609 |
| Monterey | 667,299 | 2,062,709 | Yuba | 608,250 | 959,442 |
| Napa | 92,558 | 101,264 | Other counties [1] | 5,162,584 | 4,545,213 |
| Nevada | 75,507 | 87,367 | | | |
| Orange | 4,094,469 | 4,347,366 | Total | 86,525,955 | 96,776,212 |
| Placer | 109,312 | 121,716 | | | |

[1] Includes Madera, Marin, Sonoma, and Tuolumne Counties, combined to avoid disclosing individual company confidential data.

**TABLE 32.—Stone sold or used by producers, 1955–56, by uses**

| Use | | 1955 | | 1956 | |
|---|---|---|---|---|---|
| | | Quantity | Value | Quantity | Value |
| Dimension stone: | | | | | |
| Rough construction and rubble | short tons | 23,169 | $342,697 | 40,468 | $731,991 |
| Rough architectural | cubic feet | 70,252 | 131,163 | [1] 45,015 | [1] 303,800 |
| Approximate equivalent in short tons | | 5,670 | | 3,884 | |
| Monuments and mausoleums | cubic feet | 25,390 | 158,038 | 52,329 | 569,296 |
| Approximate equivalent in short tons | | 2,083 | | 4,510 | |
| Flagging | cubic feet | 10,008 | 19,271 | 6,794 | 13,751 |
| Approximate equivalent in short tons | | 822 | | 584 | |
| Total dimension stone (quantities approximate in short tons) | | 31,744 | 651,169 | 49,446 | 1,618,838 |
| Crushed and broken stone: | | | | | |
| Riprap | short tons | 727,866 | 1,513,269 | 1,369,152 | 2,322,133 |
| Metallurgical | do | 61,501 | 223,682 | 52,240 | 171,561 |
| Concrete and roadstone | do | 11,047,258 | 12,426,429 | 11,829,859 | 15,466,048 |
| Railroad ballast | do | 168,823 | 177,225 | 144,771 | 167,318 |
| Agricultural | do | 576 | 4,653 | 1,720 | 8,336 |
| Chemical | do | 69,960 | 336,977 | 28,284 | 81,454 |
| Miscellaneous [2] | do | [3] 12,600,593 | [3] 21,830,980 | [4] 19,107,898 | [4] 26,272,964 |
| Total crushed and broken stone | do | 24,676,577 | 36,513,215 | 32,533,924 | 44,489,814 |
| Grand total (quantities approximate in short tons) | | 24,708,321 | 37,164,384 | 32,583,370 | 46,108,652 |

[1] Includes 13,005 cubic feet valued at $64,400 of dressed architectural stone.
[2] Includes whiting substitute, filler, mineral food, poultry grit, stucco, roofing granules, filter beds, terrazzo, and miscellaneous uses.
[3] Includes 10,462,734 short tons of limestone used in cement valued at $15,514,339 and 514,818 tons of limestone used in lime valued at $917,095.
[4] Includes 11,583,084 short tons of limestone used in cement valued at $16,119,212 and 676,456 tons of limestone used in lime valued at $1,235,698.

Digitized by Google

increase in value, compared with 1955, was due primarily to greater demand for crushed and broken stone used in concrete and roadstone and was particularly noticeable in the outputs of crushed granite in Los Angeles County and crushed basalt in Marin County. The quantity of dimension stone (both rough and dressed) produced for construction and architectural uses also increased substantially. The output of marble for terrazzo and limestone, granite, and basalt for roofing granules showed little variation from 1955 figures despite a slight statewide decline in new home construction.

**TABLE 33.—Production of stone [1] in 1956, by counties**

| County | Short tons | Value | County | Short tons | Value |
|---|---|---|---|---|---|
| Alameda | 1,218,764 | $784,940 | San Benito | 1,188,900 | $1,858,118 |
| Butte | 83,211 | 73,961 | San Bernardino | 4,705,587 | 7,091,552 |
| Contra Costa | 2,375,230 | 3,211,808 | San Diego | 400,753 | 1,347,940 |
| Del Norte | 118,685 | 192,857 | San Francisco | 849,042 | 433,663 |
| El Dorado | 396,227 | 985,325 | San Mateo | 2,680,419 | 2,510,993 |
| Fresno | 143,953 | 364,355 | Santa Clara | 4,329,640 | 4,654,761 |
| Humboldt | 34,835 | 44,712 | Santa Cruz | 946,933 | 1,602,750 |
| Imperial | 47,285 | 50,965 | Shasta | 114,147 | 98,014 |
| Kern | 1,755,242 | 3,725,622 | Siskiyou | 109,880 | 109,880 |
| Lassen | 99,423 | 173,624 | Solano | 295,800 | 406,781 |
| Los Angeles | 2,336,968 | 3,725,604 | Tehama | 10,725 | 32,175 |
| Marin | 1,305,859 | 2,059,599 | Trinity | 8,282 | 13,632 |
| Mariposa | 14,129 | 22,665 | Tulare | 46,793 | 70,027 |
| Mendocino | 41,655 | 53,975 | Tuolumne | 779,810 | 1,474,883 |
| Modoc | 44,266 | 66,399 | Ventura | 25,662 | 217,877 |
| Mono | 6,000 | 5,000 | Yolo | 38,675 | 68,321 |
| Plumas | 6,126 | 6,279 | Other counties [2] | 4,275,788 | 5,993,173 |
| Riverside | 1,740,790 | 2,558,791 | | | |
| Sacramento | 7,886 | 17,631 | Total | 32,583,370 | 46,108,652 |

[1] Includes stone used in cement and lime.
[2] Includes Amador, Calaveras, Colusa, Inyo, Madera, Monterey, Napa, Orange, Placer, San Luis Obispo, Santa Barbara, and Sonoma, combined to avoid disclosing individual company confidential data.

**TABLE 34.—Stone sold or used by producers, 1952–56, by kinds**

| Year | Granite | | Basalt and related rocks (traprock) | | Marble | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | 1,903,866 | $1,979,756 | 1,996,836 | $2,524,972 | 7,168 | $137,664 |
| 1953 | 3,565,847 | 3,214,767 | 2,664,009 | 2,800,346 | (1) | (1) |
| 1954 | 3,012,041 | 3,480,586 | 2,129,545 | 2,786,035 | (1) | (1) |
| 1955 | 2,724,342 | 3,420,057 | 1,923,351 | 2,547,821 | (1) | (1) |
| 1956 | 3,899,350 | 5,155,292 | 1,966,581 | 2,339,318 | (1) | (1) |

| Year | Limestone | | Sandstone | | Other Stone [2] | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | 1,631,369 | $4,033,203 | 1,029,084 | $1,290,141 | 7,806,607 | $7,731,349 | 14,374,930 | $17,697,085 |
| 1953 | 1,993,217 | 4,940,034 | 2,093,219 | 2,835,693 | 4,188,796 | 4,903,511 | 14,505,088 | 18,694,351 |
| 1954 | [3] 11,044,061 | [3] 21,434,189 | 2,703,599 | 3,723,255 | 4,414,510 | 6,117,049 | 23,303,756 | 37,541,114 |
| 1955 | [4] 12,472,285 | [4] 21,075,656 | 2,937,537 | 4,886,507 | 4,650,806 | 5,234,343 | 24,708,321 | 37,164,384 |
| 1956 | [5] 14,115,070 | [5] 22,118,105 | 2,917,916 | 4,833,877 | 9,684,453 | 11,662,060 | 32,583,370 | 46,108,652 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes light colored volcanics, schist, serpentine, river boulders, and such other stone as cannot properly be classed in any main group, and marble (1953–56).
[3] Includes 9,567,191 tons of limestone valued at $17,229,547 used in cement and lime.
[4] Includes 10,977,552 tons of limestone valued at $16,431,434 used in cement and lime.
[5] Includes 12,259,540 tons of limestone valued at $17,354,910 used in cement and lime.

Digitized by Google

Sandstone production also remained virtually unchanged, although its utilization varied considerably, inasmuch as the gain in demand for sandstone as riprap was offset by lower requirements for use as ganister, concrete, and roadstone. Of special interest were the large tonnages of crushed miscellaneous stone used at the Monticello Dam in Napa County and in the Beardsley Project in Tuolumne County.

**Strontium Minerals.**—Production of celestite was reported from two counties. An important tonnage of the mineral from San Bernardino County was shipped to southern Nevada and used in concentrating certain manganese ores. A few tons produced in San Diego County was shipped to a chemical plant in Los Angeles and converted to strontium carbonate for reagent use.

**Sulfur.**—Sulfur-ore production in 1956 was limited to the Leviathan open pit of The Anaconda Co. in Alpine County. The output of this mine, although slightly less than in 1955, conformed to company requirements for sulfuric acid used at its copper-leaching plant in Lyon County, Nev. The average grade of the ore mined and shipped was about 30 percent sulfur.

During the year elemental sulfur was recovered as a byproduct from hydrogen sulfide gas obtained in petroleum refining. In Los Angeles County Hancock Chemical Co., Union Oil Co. of California, and Wilshire Oil Co. of California produced sulfur at their plants in Watson, Wilmington, and Norwalk, respectively. The Union Oil Co. also recovered elemental sulfur from hydrogen sulfide gas at its refineries in Contra Costa and San Luis Obispo Counties. Approximately 80 percent of the sulfur produced was utilized in manufacturing sulfuric acid. A base-metal smelter in Contra Costa County produced liquid sulfur dioxide and sulfuric acid as byproducts in roasting sulfide ores. Production was shipped to chemical companies in the bay area.

**Talc, Soapstone, and Pyrophyllite.**—The 1956 output of these minerals in California dropped nearly 8 percent below 1955. The decline was not general, based on use, in that the tonnages used in ceramics and for asphalt filler were appreciably above those in the preceding year. The most noticeable declines were in the use of talc and soapstone for filler in paint, paper, and rubber. The drop in the quantity used as a carrier in insecticides was due to substitution of such materials as diatomite and pumicite. Most of the State's 1956 talc production was mined at deposits in Inyo and San Bernardino Counties. All of the soapstone output was obtained from mines in El Dorado and Los Angeles Counties, and the entire 1956 yield of pyrophyllite came from producers in Mono, San Bernardino, and San Diego Counties. Several major producers operated grinding plants in counties other than those where the raw materials were produced. Some grinders of these materials processed the crude minerals obtained from company-owned deposits outside the State. Other processors of talc and soapstone purchased the California-produced crude minerals and received shipments from out-of-State producers as well. The tonnage of talc, soapstone, and pyrophyllite ground (or otherwise processed) by California plants in 1956 was nearly 14 percent below 1955.

**Vermiculite.**—No crude vermiculite was mined in California. One company in Orange County operated an exfoliation plant on the

Digitized by Google

crude mineral imported from Portuguese East Africa. The entire output of this plant was used in plaster aggregate. Another company operated exfoliation plants in Los Angeles and Sacramento Counties, using vermiculite mined at its Montana property. The output of these plants was utilized in thermal and acoustic insulation and in lightweight concrete (to prevent segregation). The total production of exfoliated mineral was slightly below that in the preceding year. The truckdrivers' strike during the latter part of 1956 was credited as a factor contributing to the decline.

**Wollastonite.**—Several hundred tons of wollastonite was quarried at three deposits near Blythe, Riverside County. Because of its distinctive weathered appearance, the entire output was sold to a Los Angeles supplier of ceramic materials and used as ornamental stone for rubble-type facing of building structures.

## MINERAL FUELS

**Carbon Dioxide (Natural Gas).**—The Cal Dry Ice Corp. continued the operation of its well in the Hopland field, Mendocino County, as a source of "dry ice." In the latter part of the year water reported as containing a boron mineral or boron minerals seeped from the well and allegedly destroyed the nearby vegetation. It became necessary to correct this situation to continue the production of carbon dioxide. An estimate of the cost involved proved to be prohibitive, and the well was shut down in October.

**Coal (Lignite).**—Lignite was mined in 1956 near Ione (Amador County) primarily for its montan-wax content. Production increased 57 percent above 1955.

**Natural Gas.**—In 1956 slightly less natural gas was marketed than in 1955, both in terms of quantity and value. Wet-gas production accounted for 73 percent of the total. The California (State) Division of Oil and Gas listed 201 producing gasfields during the latter half of 1956. The Rio Vista field in Sacramento, Solano, and Contra Costa Counties remained much the largest gasfield in the State with a production for the year of 70,683,850 thousand cubic feet. The discovery of four new dry gasfields of minor importance was reported—one each in Colusa, Glenn, Sacramento and San Joaquin Counties. Two new wet gasfields were reported in Kern County.

**Natural-Gas Liquids.**—The quantity of natural gasoline and cycle products processed in 1956 decreased slightly below 1955. The LP-gases produced, however, increased 14 percent in quantity and 10 percent in value.

**Peat.**—Peat production, for use as a soil-improving agent, increased substantially in value over 1955. Most of the peat dug came from the delta of the San Joaquin River near Brentwood (Contra Costa County). Production was also reported from Jess Valley (Modoc County) and from Orange County.

**Petroleum.**—The quantity of crude oil produced in California was slightly lower in 1956 than in 1955, but the value was 4 percent higher. First- and second-half-year outputs were almost exactly equal. Although exploratory drilling continued to be active, it was below that in 1955. New well proposals decreased from 2,507 in 1955 to 2,467 in

Digitized by Google

1956. The California (State) Division of Oil and Gas listed 185 producing oilfields during the latter half of 1956. No major oilfield discoveries were reported during the year, but nine new minor fields were reported. Five were in Kern County, 2 in Orange County, and 1 each in San Benito and San Mateo Counties.

**TABLE 35.—Natural gas, natural-gas liquids, and petroleum produced, in 1956,[1] by counties**

| County | Marketed natural gas | | Natural-gas liquids | | | | Petroleum | |
|---|---|---|---|---|---|---|---|---|
| | | | Natural gasoline and cycle products | | LP-gases from plants | | | |
| | Million cubic feet | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) | Thousand 42-gallon barrels | Value (thousand dollars) |
| Butte | 5,677 | 1,419 | | | | | | |
| Colusa | 882 | 221 | | | | | | |
| Contra Costa | 1,162 | 291 | | | | | | |
| Fresno | 34,243 | 7,396 | 64,692 | 6,243 | 61,289 | 3,187 | 35,980 | 104,449 |
| Glenn | 6,077 | 1,519 | | | | | | |
| Humboldt | 2,230 | 558 | | | | | | |
| Kern | 78,148 | 16,880 | 211,782 | 20,435 | 168,686 | 8,772 | 96,485 | 244,493 |
| Kings | 11,247 | 2,429 | 16,041 | 1,548 | 6,851 | 356 | 2,437 | 7,722 |
| Los Angeles | 95,409 | 20,608 | 272,705 | 26,314 | 57,556 | 2,993 | 92,024 | 243,036 |
| Madera | 3,190 | 798 | | | | | | |
| Monterey | 4,169 | 901 | | | | | 11,733 | 18,890 |
| Orange | 26,989 | 5,830 | 111,852 | 10,793 | 18,132 | 943 | 37,051 | 95,147 |
| Sacramento | 49,511 | 12,378 | | | | | | |
| San Benito | 124 | 31 | | | | | 100 | (2) |
| San Bernardino | 7 | 2 | | | | | 110 | (2) |
| San Joaquin | 15,588 | 3,897 | | | | | | |
| San Luis Obispo | 1,697 | 367 | 10,344 | 998 | 4,964 | 258 | 2,423 | 7,256 |
| San Mateo | 3 | 1 | | | | | 17 | 57 |
| Santa Barbara | 18,757 | 4,052 | 45,144 | 4,356 | 16,040 | 834 | 29,006 | 77,882 |
| Solano | 35,467 | 8,867 | | | | | | |
| Sonoma | 136 | 29 | | | | | 1 | 1 |
| Sutter | 1,055 | 264 | | | | | | |
| Tehama | 1,437 | 359 | | | | | | |
| Tulare | 6,449 | 1,612 | | | | | 54 | 116 |
| Ventura | 80,348 | 17,355 | 144,022 | 13,897 | 76,714 | 3,989 | 43,021 | 119,427 |
| Yolo | 2,474 | 618 | | | | | | |
| Undistributed | 21,982 | 4,821 | 320 | 31 | | | 312 | 499 |
| Total | 504,458 | 113,503 | 876,902 | 84,615 | 410,232 | 21,332 | 350,754 | 918,975 |

[1] Production from petroleum and natural-gas fields that lie in more than 1 county prorated among the involved counties.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

## REVIEW BY COUNTIES

Six counties produced minerals that represented over 75 percent of California's total mineral-production value; nearly 90 percent of this amount was accredited to mineral fuels. The counties (in the order of the value of their production) were: Los Angeles, Kern, Ventura, Fresno, Orange, and Santa Barbara. In 1956 Fresno replaced Orange County as California's fourth ranking producer of mineral commodities, primarily because of an increase and decrease, respectively, in the mineral-fuels output of the two counties. Los Angeles County again led the State in mineral-fuels production, and San Bernardino County ranked first in the output of nonmetals. Riverside County continued to be the top producer of metals, largely by virtue of its iron-ore output.

Digitized by Google

**TABLE 36.—Value of mineral production in California, 1955–56, by counties**

| County | 1955 [2] | 1956 | Minerals produced in 1956 in order of value [1] |
|---|---|---|---|
| Alameda | $16,311,467 | $20,417,259 | Sand and gravel, salt, magnesium compounds, stone, bromine, clays. |
| Alpine | (3) | (3) | Sulfur ore, tungsten, sand and gravel. |
| Amador | 1,271,832 | 1,633,536 | Clays, sand and gravel, coal (lignite), copper, stone, gold, silver, lead, gem stones. |
| Butte | 2,286,168 | 2,559,164 | Natural gas, sand and gravel, chromite, stone, gold, silver. |
| Calaveras | 10,014,759 | 11,466,710 | Cement, stone, clays, sand and gravel, copper, gold, tungsten, silver, gem stones. |
| Colusa | 351,115 | 406,861 | Natural gas, sand and gravel, stone, gem stones. |
| Contra Costa | 3,884,231 | 5,174,878 | Stone, sulfur (byproduct), natural gas, sand and gravel, peat, clays, potassium salts. |
| Del Norte | 639,415 | 599,216 | Chromite, stone, sand and gravel, mercury, copper, silver. |
| El Dorado | 2,062,384 | 2,282,684 | Lime, stone, sand and gravel, slate, gold, soapstone, copper, lead, silver, tungsten, zinc. |
| Fresno | 112,347,442 | 123,483,407 | Petroleum, natural gas liquids, natural gas, sand and gravel, chromite, stone, tungsten, clays, gold, mercury, pumice, silver, gem stones. |
| Glenn | 706,479 | 1,910,200 | Natural gas, sand and gravel, chromite. |
| Humboldt | [4] 1,102,215 | 1,734,711 | Sand and gravel, natural gas, stone, chromite, copper, gem stones, silver. |
| Imperial | [4] 2,178,778 | 2,446,840 | Gypsum, sand and gravel, stone, pumice and pumicite, manganese ore, mica (scrap), gold, gem stones, uranium, silver. |
| Inyo | [4] 17,162,980 | 17,239,485 | Tungsten, lead, zinc, molybdenum, silver, sodium carbonate, pumice, pumicite and volcanic cinder, talc, copper, sand and gravel, stone, boron minerals, gold, clays, perlite, asbestos, uranium, barite, gem stones. |
| Kern | 321,341,429 | 340,970,947 | Petroleum, boron minerals, natural gas liquids, natural gas, cement, stone, sand and gravel, gypsum, clays, gold, tungsten, salt, sodium sulfate, pumice, silver, uranium, copper, gem stone, zinc. |
| Kings | 13,781,021 | 12,257,020 | Petroleum, natural gas, natural gas liquids, gypsum, mercury, sand and gravel. |
| Lake | [4] 747,620 | [4] 829,667 | Mercury, sand and gravel, pumice and volcanic cinder, gem stones. |
| Lassen | [4] 306,203 | 656,227 | Sand and gravel, stone, volcanic cinder. |
| Los Angeles | 318,687,274 | 334,277,226 | Petroleum, sand and gravel, natural gas liquids, natural gas, stone, sulfur (byproduct), cement, diatomite, clays, iodine, soapstone, gold, silver. |
| Madera | 1,801,511 | 1,618,691 | Natural gas, sand and gravel, tungsten, pumicite, stone, copper, gold, silver. |
| Marin | 1,388,526 | 2,339,295 | Stone, sand and gravel, clays, mercury, gem stones. |
| Mariposa | 185,108 | 234,594 | Sand and gravel, gold, stone, tungsten, slate, silver, copper, gem stones. |
| Mendocino | 447,625 | 436,245 | Sand and gravel, stone, carbon dioxide, manganese ore, gem stones. |
| Merced | 1,061,708 | 1,478,685 | Sand and gravel, mercury, gypsum, gold, silver. |
| Modoc | 249,743 | 429,459 | Sand and gravel, pumice and volcanic cinder, peat, stone, gem stones. |
| Mono | 4,424,537 | 4,334,564 | Tungsten, pumice and volcanic cinder, sand and gravel, pyrophyllite, clays, stone, gem stones, gold, silver. |
| Monterey | 23,641,021 | 28,302,774 | Petroleum, lime, sand and gravel, magnesium compounds, feldspar, stone, natural gas, salt, chromite, mercury, gem stones. |
| Napa | 1,269,276 | 1,647,973 | Stone, diatomite, sand and gravel, perlite, mercury, chromite, asbestos, gem stones. |
| Nevada | 2,018,522 | 1,454,234 | Gold, barite, tungsten, sand and gravel, silver. |
| Orange | 127,990,556 | 117,873,865 | Petroleum, natural gas liquids, natural gas, sand and gravel, iodine, clays, salt, peat, stone. |
| Placer | 533,799 | 563,314 | Clays, sand and gravel, stone, gold, chromite, tungsten, asbestos, gem stones, silver. |
| Plumas | 138,935 | 154,386 | Sand and gravel, manganese ore, stone, gold, copper, silver. |
| Riverside | [4] 29,273,556 | 39,477,680 | Iron ore, cement, stone, sand and gravel, clays, gypsum, manganese ore, tungsten, copper, gem stones, silver, gold. |
| Sacramento | 19,507,504 | 18,136,327 | Natural gas, sand and gravel, gold, clays, stone, platinum, silver. |
| San Benito | 5,043,905 | 5,163,927 | Cement, stone, mercury, petroleum, sand and gravel, chomite, natural gas, clays, gem stones. |
| San Bernardino | 71,779,792 | 81,932,310 | Cement, boron minerals, sodium carbonate, stone, potassium salts, sodium sulfate, sand and gravel, tungsten, salt, talc and pyrophyllite, calcium-magnesium chloride, petroleum, bromine, lime, clays, rare earths, pumicite and volcanic cinder, strontium minerals, iron ore, perlite, copper, manganese ore, gold, feldspar, lead, silver, natural gas, gem stones, mercury, zinc, uranium ore. |

See footnotes at end of table.

Digitized by Google

**TABLE 36.—Value of mineral production in California, 1955–56, by counties—Con.**

| County | 1955 [2] | 1956 | Minerals produced in 1956 in order of value [1] |
|---|---|---|---|
| San Diego | $5,456,730 | $7,281,856 | Sand and gravel, stone, salt, magnesium compounds, clays, tungsten, pyrophyllite, gem stones, strontium minerals, gold. |
| San Francisco | 39,938 | 617,903 | Stone, sand and gravel. |
| San Joaquin | [4] 4,302,310 | 6,262,844 | Natural gas, sand and gravel, clays. |
| San Luis Obispo | 11,629,505 | 10,812,246 | Petroleum, natural gas liquids, chromite, sand and gravel, natural gas, sulfur (byproduct), stone, gypsum, mercury, clays, manganese, gem stones. |
| San Mateo | 9,949,667 | 9,873,577 | Cement, stone, magnesium compounds, clays, mercury, sand and gravel, petroleum, natural gas, gem stones. |
| Santa Barbara | 91,568,575 | 101,973,862 | Petroleum, diatomite, natural gas liquids, natural gas, sand and gravel, stone, mercury, chromite, clays. |
| Santa Clara | 21,403,152 | 24,782,941 | Cement, stone, sand and gravel, mercury, clays, masonry, cement magnesite, gem stones. |
| Santa Cruz | 8,052,923 | 7,631,707 | Cement, stone, sand and gravel, clays, potassium salts. |
| Shasta | 1,726,412 | 1,531,280 | Pyrites, sand and gravel, stone, volcanic cinder, gold, zinc, copper, lead, silver. |
| Sierra | 708,064 | 377,425 | Gold, sand and gravel, silver. |
| Siskiyou | [4] 1,532,833 | 2,165,914 | Pumice, pumicite and volcanic, gold, sand and gravel, chromite, stone, silver, gem stones. |
| Solano | 9,951,939 | 11,112,903 | Natural gas, clays, sand and gravel, stone. |
| Sonoma | [4] 2,422,613 | 3,595,124 | Sand and gravel, stone, mercury, clays, natural gas, petroleum. |
| Stanislaus | [4] 475,614 | 782,414 | Sand and gravel, clays, chromite, gold, mercury, silver. |
| Sutter | 382,113 | 2,215,262 | Sand and gravel, natural gas, clays. |
| Tehama | 801,841 | 667,606 | Natural gas, sand and gravel, chromite, stone. |
| Trinity | [4] 424,431 | 540,620 | Sand and gravel, gold, manganese ore, stone, copper, chromite, mercury, silver. |
| Tulare | 3,104,362 | 3,022,299 | Natural gas, sand and gravel, tungsten, petroleum, stone, barite, clays, gem stones. |
| Tuolumne | 1,179,017 | 4,150,232 | Sand and gravel, stone, lime, tungsten, gold, silver. |
| Ventura | 158,740,924 | 158,526,508 | Petroleum, natural gas liquids, natural gas, sand and gravel, stone, clays, gypsum. |
| Yolo | 1,323,480 | 1,318,930 | Sand and gravel, natural gas, stone. |
| Yuba | 3,307,067 | 3,651,441 | Gold, sand and gravel, clays, platinum, silver. |
| Undistributed [3] | 2,030,808 | 6,443,387 | |
| Total | 1,456,513,000 | 1,555,263,000 | |

[1] Excludes lithium.
[2] Includes revised county distribution of natural gas.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[4] Excludes value of manganese and low-grade manganese ores sold and blended at Government low-grade stockpiles for future beneficiation.
[5] Includes natural gas, petroleum, sulfur ore, gem stones, tungsten, sand and gravel, mercury, manganese ore, chromite, talc and value indicated by footnote. [3]

**Alameda.**—Sand and gravel contributed over $11 million to Alameda County economy; it was produced principally by the Henry J. Kaiser Co. and Pacific Cement & Aggregates, Inc., near Pleasanton and Niles, primarily for structural and paving use. The latter company also worked a pit near Fremont, as did Rhodes & Jamieson, Ltd. Other commercial producers were Bell's Sand & Gravel Co. at Irvington; California Rock & Gravel Co. at Livermore; Deetz Sand & Gravel Co. and A. C. Zaro Gravel Pit at Pleasanton; and Niles Sand & Gravel Co., Inc., at Niles.

American Salt Co. and Oliver Bros. Salt Co. at Mount Eden and Leslie Salt Co. and Morton Salt Co. at Newark had an overall increased production of salt from sea water at San Francisco Bay plants in 1956. The greater demand for salt was from food processors and chlorine and water-softener producers. Westvaco Mineral Products Division, Food Machinery & Chemical Corp., produced bromine and magnesium compounds from salt-works bitterns at Newark. Raw dolomite was used in the magnesia plant, and synthetic gypsum was

Digitized by Google

recovered as a byproduct. Philadelphia Quartz Co. of California at Berkeley used California magnesite and Nevada brucite in manufacturing hydrous magnesium sulfate (epsom salt).

Gallagher & Burk, Inc., crushed basalt at the Leona Quarry in Oakland for concrete aggregate and fill. Miscellaneous stone was produced for fill by Goddard Bros. near Hayward, Niles Quarry Co. at Niles, San Leandro Rock Co. at San Leandro, and the California Division of Highways. Sandstone was quarried and crushed by Independent Construction Co. in Oakland for use in road construction. Miscellaneous clay was produced at Niles by California Pottery Co. for building materials and refractory use and by Interlocking Roof Tile Co. and Kraftile Co. for building materials. Bell's Sand & Gravel Co. at Irvington was the major clay producer in the county, supplying a Santa Clara County brick plant.

Crude barite from Nevada deposits was ground for well-drilling mud, paint filler, and chemicals by Chemical & Pigment Co., in Oakland; Industrial Minerals & Chemical Co., in Berkeley; Westvaco Mineral Products Co., in Newark; and Yuba Milling Division, Metals Disintegrating Co., in Emeryville. Industrial Minerals & Chemical Co. operated its grinding plant on a custom basis and ground chromite, clays, feldspar, fullers earth, pinite, soapstone, and volcanic ash, all produced outside the county. Pabco Products, Inc., calcined company-produced Nevada gypsum at its Newark wallboard plant and operated an asphalt plant at Emeryville. Also at Emeryville, C. K. Williams Co. manufactured natural and synthetic iron oxide pigments from material produced outside the State, and Judson Steel Corp. operated open-hearth steel furnaces. Pacific State Steel Corp. operated 3 open-hearth steel furnaces at Niles, with an annual capacity of 216,000 tons.

**Alpine.**—Production of the only sulfur ore mined in California by The Anaconda Co., from its Leviathan mine near Markleville, continued high in 1956. Sulfur-ore shipments made up about one-fourth of California's total production of elemental and contained sulfur during the year. The ore was trucked to the company plant at Weed Heights near Yerington, Nev., where it was manufactured into sulfuric acid for leaching copper oxide ore.

A small tonnage of tungsten concentrate was shipped from four mines in the *Hope Valley* district near Woodfords, and about one-half of Alpine County's total output of tungsten concentrate was produced by C. B. Lovestedt from ores of the Alpine and Alturas mines. Clyde Morrison shipped tungsten ore from the Valpine mine to the newly activated mill of the Metallurgical Development Co. east of Gardnerville, Nev.

The California Division of Highways contracted for paving sand and gravel produced at various sites in the county.

**Amador.**—Fire-clay production, valued at $765,000 in 1956, continued to lead Amador County's mineral output. Gladding, McBean & Co., Ione Clay & Sand Corp., Pacific Clay Products, and Western Refractories Co., all in the Ione area, sold or used most of their output for refractories and heavy clay products. Owens-Illinois Glass Co. produced glass sand near Ione, in conjunction with Gladding, McBean & Co., which utilized clay separated at the same plant. Sierra Sand-Gravel Co. prepared gravel near Sutter Creek for paving. Gravel for

Digitized by Google

paving was also produced by crews of the Amador County Road Department.

The output of stone in the county was 56 percent higher in 1956 than in 1955, due primarily to the increased production of granite for roofing granules by Harley T. Kreth near Lancha Plana. American Lignite Co. mined lignite from open pits near Ione, principally for its montan-wax content, which was recovered at the Buena Vista plant.

Fitzgerald, Smith & Associates mined copper ore containing values in gold, silver, and lead from the Copper Hill lode mine in the *West Belt* district near Plymouth. The operators leased the Volo mill at Placerville in El Dorado County for treatment of the ore and shipped copper concentrate to a smelter at Tacoma, Wash. Gold was recovered at Selby, Contra Costa County, from gold ore mined at the Italian mine operated by the American International Mining & Milling Co. in the *Mother Lode* district near Drytown. Amador County's placer gold and silver output was principally from the dragline operations at the Lorentz group in the *Cosumnes River* district near Plymouth and the Garibaldi placer mine in the *East Belt* district near Volcano. Alvah G. Ekel hydraulicked 1,000 cubic yards of bench gravel at the Waddell Ranch (Blue Bucket) mine near Ione and shipped a small quantity of gold and silver in bullion to the United States Mint.

The Fresno Gem & Mineral Society collected 400 pounds of rhodonite for gem stone at the Lubanko mine near Fiddletown.

**Butte.**—Dry natural gas continued to be the most valuable mineral product of Butte County in 1956. Production was reported from the Wild Goose, Durham, Chico, and Perkin's Lake fields. The Wild Goose field supplied 86 percent of the total quantity produced.

Five firms produced sand and gravel—1 sand only and 3 gravel only. Of the nearly 600,000 tons of sand and gravel produced and shipped during the year over 50 percent was moved by truck, the remainder by rail. The Henry J. Kaiser Co. was far the leading shipper. The chief sources of Butte County's sand and gravel production were pits near Chico, Oroville, Gridley, Biggs, and Richvale.

Chromite ore was shipped for concentrating by the Castella Mining & Milling Co. from its Lambert mine in the *Magalia* district to the Castella mill in Shasta County. Most of the concentrate produced was under 45 percent $Cr_2O_3$ and made up about one-third of California's output of this grade.

The California Division of Highways contracted for the production in the county of crushed granite and paving gravel used as aggregate and road metal, as did the Butte County Highway Department for miscellaneous stone which had the same end use.

Six small placer-gold operations were active during 1956, one more than in 1955. Four of these were in the *Oroville* district and one each in the *Forbestown* and *Butte Creek* districts. The quantity of gold recovered was 20 percent less than in 1955.

**Calaveras.**—The cement output of the Calaveras Cement Co., with its five-kiln plant at Kentucky House, continued to have a higher value than any other mineral commodity produced in Calaveras County. Limestone and clays—raw materials for portland cement—were quarried in the *East Belt* district.

Digitized by Google

One firm in the county produced sand and gravel and two gravel only. Total shipments exceeded 100,000 tons, all moved by truck. The active pits were near Angels Camp, Sonora, and Mokelumne Hill. The Calaveras County Highway Engineer produced paving sand and gravel, and the California Division of Highways contracted for the production of paving sand in the county.

Minor tonnages of fire clay and miscellaneous clay were dug from a pit near Valley Springs.

At Calaveras County's placer- and lode-gold mines, minor quantities of gold and silver were recovered. Direct smelting ore that contained several thousand pounds of copper, a few ounces of gold, and considerable silver was shipped from the *West Belt* district. Union Copper Co., a subsidiary of Daybreak Uranium, Inc., began shipping copper ore from the old Calaveras mine at Copperopolis, and the Standard Mining Corp. shipped copper ore, containing gold and silver, from the New Penn mine near Campo Seco. The total value of the gold, silver, and copper at smelters was more than $30,000.

The Moore Creek Mining Co. shipped a minor quantity of tungsten concentrate recovered at its mine near Pioneer.

**Colusa.**—Natural gas was withdrawn from the Princeton field, Colusa County's only producing field in 1956.

The California Division of Highways and Colusa County Highway Department, and their contractors, produced 81 percent of the county's total sand and gravel output, nearly 130,000 tons of which was used for paving. Other producers of structural or paving sand and gravel were Baldwin Contracting Co., Inc., Cortina Rock Sand & Gravel, Paul Entremont, and Harms Bros., Inc., from various deposits in the county.

California Cut Stone & Granite Works quarried "Colusa Sandstone" near Sites, for use in building construction. Onyx for gem collectors was gathered at Sulphur Creek.

**Contra Costa.**—Blake Bros., at Point Richmond and Serra Bros., at Pacheco crushed sandstone obtained from their respective quarries, for use as riprap, concrete aggregate, and railroad ballast. The California Division of Highways contracted for the production of crushed sandstone in Contra Costa County; it was used as concrete aggregate and roadstone.

A. C. and A. M. Goerig crushed basalt from the Tunnel Rock quarry near Orinda for use as riprap, aggregate, and roadstone. The United States Naval Magazine, Port Chicago, contracted to produce a minor tonnage of crushed basalt used as riprap and of gravel used as aggregate. The Henry J. Kaiser Co. and the Pacific Cement and Aggregates, Inc., both produced miscellaneous stone from near Clayton for concrete aggregate and roadstone.

The Standard Oil Co. of California continued to recover hydrogen sulfide from crude oil at its Richmond plant, which was piped to the sulfuric acid plant at General Chemical Division, Allied Chemical & Dye Corp. at Richmond. The Tidewater Oil Co. also recovered hydrogen sulfide and delivered it to the Monsanto Chemical Co. sulfuric acid plant at Avon. The Union Oil Co. of California recovered molten sulfur from crude oil at its Rodeo refinery.

Although no petroleum was produced in the county four crude-oil refineries were active at Richmond, Oleum, Martinez, and Avon;

Digitized by Google

these were plants, respectively, of the Standard Oil Co. of California, the Union Oil Co. of California, the Shell Oil Co., and the Tidewater Oil Co. The crude petroleum refined in the county was of both domestic and foreign origin and reached the plants by rail, truck, pipeline, and tanker. The combined daily throughput capacity of the refineries was 342,300 barrels. There was a net combined decrease in daily capacity of 22,100 barrels in 1956 compared with 1955. No natural gasoline and cycling plants operated in Contra Costa County in 1956.

Natural gas was produced from a small portion of the Rio Vista field—the largest gasfield in the State. This field also lies in Solano and Sacramento Counties. Approximately 2 percent of the State's 1956 field production of natural gas was produced in Contra Costa County.

At Selby the American Smelting and Refining Co. continued to recover sulfur dioxide by smelting sulfide ores; about one-half was converted to liquid sulfur dioxide and one-half to sulfuric acid.

The major portion of the peat dug in the State came from the delta of the San Joaquin River near Brentwood. The Federal Bureau of Reclamation and the California Division of Highways contracted for the production in the county of sand used in concrete. Four firms produced sand and one, gravel only. More than 178,000 tons of sand and gravel were produced and shipped in 1956, by rail and truck. The principal operating pits were near Cowell and Antioch. A small tonnage of furnace sand was produced from the Antioch pit. Minor tonnages of miscellaneous clay were dug from pits near Port Costa and Richmond for use locally in brick plants.

The Kaiser Gypsum Co. imported crude gypsum from San Marcos Island, Lower California, Mexico, for calcining at its Antioch board and plaster plant.

The Selby smelter of the American Smelting and Refining Co., California's only major smelter treating primary nonferrous material, operated largely on lead ore and concentrate of foreign origin, and refined gold and silver. Zinc fume recovered from both hot and cold slag was shipped out of California for recovering zinc and zinc oxide.

**Del Norte.**—The value of the 1956 chromite shipments was 35 percent of the total value of all minerals produced in Del Norte County. Harold T. Funk shipped 408 tons of ore and concentrate containing 44 to 49 percent $Cr_2O_3$, from the Old Doe mine in the Wimer (Low Divide) chromite area, and Holiday Mines shipped 105 tons of ore and concentrate containing 43 to 47 percent $Cr_2O_3$ from the Holiday mine in the Patrick Creek area. Major shipments of ore were also made by Tulare Mining Co. from the High Plateau mine in the High Plateau area and by J & W Mining Co. from the J & W (French Hill) mine in the French Hill area. W. B. Freeman operated the Havilah custom mill north of Gasquet; its daily capacity was about 20 tons of chromite ore.

Stone production increased from 76,000 tons in 1955 to 119,000 tons in 1956, owing to the greater demand for sandstone, basalt, and miscellaneous stone for riprap and roadstone. All of the crushed sandstone produced was used for roadstone by the California Division of Highways. Rowdy Creek Crusher Co. quarried and crushed basalt for use in surfacing and repairing private roads of the Simonson Logging Co. The production of basalt by the Del Norte County

Digitized by Google

Road Commission for paving was more than three times that in the preceding year. Peter Kiewit Sons' Co. produced 50,000 tons of miscellaneous stone from the Outer Rock quarry near Crescent City for use as jetty stone by the United States Army Corps of Engineers.

Anne Chapman and Simpson Redwood Co. removed gravel from a pit near Klamath, to be used as road base. The California Division of Highways and Del Norte County Road Commission and their contractors produced paving gravel in the Crescent City and Fort Dick areas. Marlin Tryon at Fort Dick prepared industrial sands and structural gravel.

A. Folkins & Howard Muloney recovered mercury from ores of the Webb mine in the *High Plateau* district near Gasquet. Copper ore containing silver was shipped to a smelter in the State of Washington from the Hiouchi open-pit mine operated by Hamilton Bros. in the French Hill area.

**El Dorado.**—Diamond Springs Lime Co. prepared quick and hydrated lime for building, chemical, and industrial use and hydrated lime for agriculture. The company operated 2 rotary kilns and 1 continuous hydrator at Diamond Springs.

The output of stone rose 38 percent during 1956 compared with 1955 owing to the demand for roadstone. Crews and contractors of the El Dorado County Road Department crushed granite, limestone, and miscellaneous stone at various sites in the county, used in constructing and maintaining roads. Limestone for flux, chemicals in sugar refining, and roadstone was quarried and crushed at the Cool Quarry of California Rock & Gravel Co. The output of limestone by El Dorado Limestone Co. included material for chemical uses by glass factories. T. C. Nutt and Sierra Placerite Corp. produced dimension and crushed miscellaneous stone near Placerville for rough construction and roofing granules.

Construction and maintenance crews and contractors of the California Division of Highways and the El Dorado County Road Department utilized 129,200 tons of sand and gravel, obtained for paving, from various deposits in the county. Cold Springs Sand & Gravel, the Estate of Erwin A. Goltz, Harms Bros., and J. T. White, operated sand and gravel pits in the Placerville and Meeks Bay areas.

Kelsey Slate Co. produced slate flagging at Kelsey and Pacific Minerals Co., Ltd., crushed and ground slate from its Chili Bar mine near Placerville for roofing granules and rock flour. Soapstone from the Latrobe area was mined and shipped by Frank Harris and Pacific Minerals Co., Ltd., to grinders in the San Francisco Bay area, principally for use in paint and insecticides.

Placer gold and silver output was limited to several small-scale operations, mainly in the *Mother Lode* district. Hazel Creek Mining Corp. operated the Hazel Creek mine and mill in the *East Belt* district near Pollock Pines and added a mill building and an 80-ton ball mill, increasing its flotation-mill capacity to 110 tons per 24 hours. Gold ore from the company underground mine was concentrated and shipped to a California smelter-fuming plant and yielded some lead and zinc, in addition to 2,651 ounces of gold and 945 ounces of silver. Fitzgerald, Smith & Associates worked the Noonday copper mine, in the *Mother Lode* district near Placerville, for 5 months and hauled 1,400 tons of copper ore to the company-operated Volo mill near

Digitized by Google

Placerville for treatment. Copper concentrate containing some gold and silver was shipped to a Washington smelter.

Sciaroni Bros. shipped tungsten ore from the Last Hope mine in the *East Belt* district to mills in Mariposa County and in Douglas County, Nev.

**Fresno.**—Petroleum, natural gasoline and cycle products, and liquified-petroleum and natural gases were the major mineral commodities produced in Fresno County in 1956. Their combined value was 12 percent higher than in 1955. The quantity of petroleum produced was slightly higher than in 1955. Twelve oilfields were producing in the latter half of 1956; the largest were the Guijarral Hills, Coalinga Extension East, the Fresno County portion of the Kettleman Hills North Dome, the Coalinga, and the Raisin City. The value of the natural-gas liquids decreased slightly below the 1955 value.

Four natural-gasoline plants were in operation during 1956—the General Petroleum Co. plant at Burrell, the Los Nietos Co. plant and the Standard Oil Co. of California, and the P. S. Magruder plants at Coalinga. The combined daily productive capacities of these plants was approximately 285,000 gallons—6 percent of the State total. The P. S. Magruder plant was much the largest in the county.

The quantity of natural gas from Fresno County fields utilized was 6 percent below that in 1955. Eleven fields produced wet gas in 1956, and the major fields, in their order of productivity were: The Guijarral Hills, the Coalinga Extension East, the Fresno County portion of the Kettleman Hills North Dome, and the Helm.

Nine firms quarried and shipped nearly 1 million tons of sand and gravel for aggregate; the larger part was moved by truck, the remainder by water and rail. A high percentage of material came from pits near Coalinga, Friant, Sanger and Avenal. The Federal Bureau of Reclamation, the California Division of Highways and the Fresno City Engineer contracted for the production in Fresno County of sand and gravel used as aggregate. The Fresno County Road Commission and the California Division of Highways also produced sand and gravel with their crews.

The Fresno County Commission of Public Works contracted in the county for the production of granite and miscellaneous stone which was used as road fill, and the Federal Forest Service contracted for miscellaneous stone used in road repair. A minor tonnage of miscellaneous clay was dug from a pit near Fresno and utilized at a local brick plant.

Three operators shipped chromite concentrate from the *Idria* district, nearly all of which contained over 45 percent $Cr_2O_3$.

In 1956, 13 producers shipped over 50,000 pounds of tungsten concentrate averaging 65.5 percent $WO_3$. A major source of this concentrate was the tungsten ore of the Jackpot open pit mine, near Tollhouse, operated by E. A. McMurtry and Alfred Benson. Other areas of tungsten-ore production were in the vicinity of Sanger, Piedra, and Dinkey Creek. Granite was obtained from the Clovis quarry by the Superior Academy Granite Co. for use as rough monumental stone.

The Albireo open-pit mine near Mercy Hot Springs, and the Archer underground mine, in the *Idria* district, produced a combined total of 25 flasks of mercury during 1956. Three aggregate plants recovered

Digitized by Google

gold and silver as a byproduct from ancient stream deposits near Friant.

A small quantity of pebble pumice was produced by the Fresno Pumi-Tile Co. from its South Dome property near Friant. Some chert and petrified wood were collected in Fresno County as gem stone.

**Glenn.**—During 1956 natural gas was withdrawn from the Afton, Beehive Bend, Ord Bend, and Willows fields. Substantially increased outputs of structural and paving sand and gravel were prepared by Orland Sand & Gravel Co. at Orland and of gravel for railroad ballast by the Southern Pacific Railroad Co., at Wyo, Calif. The California Division of Highways and Glenn County Road Department utilized 215,000 tons of sand and gravel for paving from various deposits worked under contract by William Dunlap, E. B. Estes, Frank Reager, Kingman Reynolds, and Harms Bros.

The Burrows chromite mine in the *Elk Creek* district southwest of Newville and a mill at Elk Creek, were operated by David Chalmers. He shipped chromite concentrate averaging more than 45 percent $Cr_2O_3$ to the Government (GSA) Grants Pass (Oreg.) Purchase Depot.

**Humboldt.**—Natural-gas production in 1956 was limited to the Eureka field.

The increased output of gravel during 1956 was due to the higher demand for paving gravel by city, county, and State road agencies, and for structural gravel by the United States Bureau of Public Roads and the United States Army Corps of Engineers. The principal producers were Eureka Sand & Gravel, on James Creek, near Arcata, and McWhorter & Dougherty, on the Eel River, near Fortuna.

Stone production rose from 21,500 tons in 1955 to 34,800 in 1956 owing to an increased output of sandstone required for road projects by the California Division of Highways. Miscellaneous stone for riprap and roads was quarried and crushed by Tom Hull at the Jacoby Creek quarry near Arcata, the McClure quarry near Blue Lake, and crews of the California Division of Highways.

Dan Haight operated the White Cedar chromite mine in the Klamath River area northwest of Martins Ferry and shipped ore averaging 47 percent $Cr_2O_3$ to the Grants Pass (Oreg.) Purchase Depot. Palos Verde Copper Co. shipped copper ore from its open-pit mine at Berry Summit on Horse Mountain near Arcata to a smelter in the State of Washington.

Roy's Rock Shop of Trinidad collected 200 pounds of jasper along the county's ocean beaches.

**Imperial.**—United States Gypsum Co. was again the leading producer of gypsum in California from open pits in the Fish Creek Mountains. The material was shipped to Plaster City for calcining at the company plaster and board plant.

The output of sand and gravel in Imperial County increased 22 percent over 1955 owing to the greater demand for structural sand and gravel by construction companies and city and county projects; it was produced principally by H. C. Gibson and Valley Transmit Cement Co., Inc., near Brawley and by Inland Materials Supply Co. and Nelson Gravel Pit near Holtville. Filter sand was prepared by Farmers Gravel Co. near Westmorland.

Stone production rose nearly 200 percent during 1956 owing to the increased output of basalt, sandstone, and granite used for riprap,

Digitized by Google

roadstone, and fill at various Government projects. The crews and contractors of the Imperial Irrigation District, produced basalt from the All-American No. 1 and Calipatra Igneous Rock quarries for riprap and quarried granite from other deposits for riprap and fill. Henry Abeyta crushed granite from a pit near Plaster City and used it in road construction. Sandstone for use as riprap in constructing a steam plant near Winterhaven, was produced by J. B. Stringfellow Co. from the nearby Pilot Knob quarry. Superlite Builders Supply Co. prepared pumice at its quarry near Calipatra for use as concrete aggregate.

Manganese ore from the Black Jet mine in the *Palo Verde* district and Pioneer mine in the *Paymaster* district, operated by Donald F. Lockwood and L. Mills Beam, respectively, was milled by Aspen Mining Co. near Blythe for shipment to a Government stockpile. Walter S. Thing operated the Black Point and Tadpole mines in the *Palo Verde* district near Blythe and was the county's leading producer of manganese ore.

Amateur collectors gathered garnet and kyanite ore specimens from the vicinity of the Bluebird mine near Ogilby. This open-pit mine (operated by R. K. Foster) yielded 263 tons of sericite schist, which was shipped to a mill at Sidewinder. John Humer, who operated the mill, ground the material for use in paint. Western Non-Metallics continued to produce and grind mica schist near Ogilby for use in making roofing materials.

Sand spikes were collected near Calexico and fossil oystershell near Plaster City for mineral specimens.

Gold and silver were recovered by an Arizona smelter from gold ore mined by J. M. Mueller at the La Colorado mine in the *Cargo Muchacho* district.

**Inyo.**—Although a wide variety of minerals was produced in Inyo County in 1956, tungsten again had the greatest production value. The Union Carbide Nuclear Co. Pine Creek mine near Bishop, continued to be the State's leading producer of tungsten ore. The company Morgan Creek flotation mill and digestion plant produced tungsten concentrate and synthetic scheelite from company and custom ore, and low-grade concentrate. Copper concentrate, containing silver and gold and molybdenum concentrate, were recovered as byproducts in the milling of the Pine Creek mine ore. Ore from the Brownstone mine, 23 miles northwest of Bishop, yielded nearly 186,000 pounds of tungsten concentrate averaging more than 70 percent $WO_3$. Other major producers included: Palmer & Decker (Adamson mine), Rom and Allison (Hanging Valley mine), S. H. Holder (Robbins mine), J. C. Esola (Shamrock mine), Lee Early, Harry David, and T. H. Stockes (Moonlight mine), Forest B. Ellis, Gene Stockman, C. V. Davis, and George Lasley (Rossi mine), and Ajax Tungsten Corp. (Tungstar mine), all in the *Bishop* district; R. G. Bradley and Richard D. Horn (Jumbo mine), in the *Union* district; R & S Mining Co. and Sooner Death Valley Mining Co., Ltd. (R & S mine) and Wm. L. Bennett (South Side mine) in the *Wildrose* district.

The Anaconda Co. was California's leading producer of zinc, lead, and silver, from lead and zinc concentrates recovered at the Darwin and Shoshone groups of mines in the *Darwin* (*Coso*) and *Resting Springs* districts, respectively. The company's lead-zinc ore also

465877—58——15

Digitized by Google

yielded gold and copper which was recovered from the concentrates at Utah and Montana smelters. Substantial quantities of lead and zinc were recovered at a California smelter-fuming plant from ore mined at the Santa Rosa mine in the *Lee* district, and at the Defense mine in the *Modoc* district. Nearly 90 percent of the gold production credited to Inyo County was contained in the lead-zinc ores mined in the *Darwin* (*Coso*) district. The remaining gold output was recovered from tungsten ores of the *Bishop* district, lead-zinc ores of the *Lee* district and lead ores of the *Modoc* district.

Columbia-Southern Chemical Corp., a subsidiary of Pittsburg Plate Glass Co., recovered sodium carbonate from dry-lake brines of Owens Lake near Bartlett. Pumicite from the Van Loon Pumice pit, near Bishop, was quarried and used for concrete aggregate by Transmix Corp. In the Little Lake area over 105,000 tons of pumice and volcanic cinder was produced and used primarily for concrete aggregate and roofing granules. Of the 65,000 tons of talc produced in the county, 37,000 tons was mined by Louise Grantham & Associates at the Big Talc and Warm Springs No. 5 deposits near Shoshone. Other major talc producers in the county included the Eureka, Talc City, Frisco, and Rogers mines of Sierra Talc & Clay Co., the Death Valley mine of Multi Mines, Inc., and the Eclipse mine of Kennedy Minerals Co., Inc. Most of the crude shipments went to grinders in Inyo and Los Angeles Counties and were ultimately used in ceramics and paint. Huntley Industrial Minerals, Inc., ground California- and Nevada-produced talc and pyrophyllite at Laws, principally for use in paint and insecticides.

Sand and gravel for structural and paving purposes was produced by Bishop Engineering & Construction Co., I. L. Croft & Son, and projects of the California Division of Highways, the Death Valley National Monument, the Inyo County highway engineer, and the North and South Districts of the Los Angeles Aqueduct and their contractors.

West End Chemical Co. quarried limestone in the Argus Range and calcined it for carbon dioxide, which was utilized in producing sodium carbonate in its plant near Trona (San Bernardino County). The byproduct lime, although of excellent chemical grade, was stockpiled for possible future use or sale.

Material from the Inyo Quartzite quarry operated by Gladding, McBean & Co. near Lone Pine was used in manufacturing silica brick in Los Angeles County. United States Borax & Chemical Corp. and its predecessor companies mined colemanite (natural calcium borate) at the Corkscrew Canyon underground and East Coleman open-pit operations near Death Valley Junction and sodium-calcium borate at the Gerstley underground mine near Shoshone, all of which were treated at the company plant at Boron (Kern County).

The active clay deposits in Inyo County during 1956 were: The Calclay and Olancha pits in the Owens Lake area (fuller's earth); the Side Hill pit near Death Valley; and Ibex pit near Tecopa (bentonite). The total output, which was less than that in 1955, was used principally as a carrier for insecticides and filter aids and in pharmaceuticals.

International Minerals & Chemical Corp. produced perlite from its mine at Fish Springs and shipped the material to company and other expanding plants in Los Angeles County.

Digitized by Google

Asbestos (amphibole) shorts obtained from the Tin Mountain-Lawrence claim near Tin Mountain, were shipped by Huntley Industrial Minerals, Inc., to the Flintkote Co. at Hilo, Hawaii. Bloodstone, for gem stone, was collected in the Panamint Range, Death Valley.

**Kern.**—The quantity of petroleum produced increased slightly above that in 1955. Five minor oilfields were discovered during the year: The Blackford, the Gonyer Anticline, the Jerry Slough, the Semitropic and the Strandsouth. During 1956, 8 crude-oil refineries were active in Kern County or about one-fifth of the 39 operating in the State. All these were in the Bakersfield area. The largest were those of the Standard Oil Co. of California and the Bankline Oil Co. The combined daily throughput capacity of these refineries was 64,400 barrels—5 percent of the State total. The net increase in daily capacity during 1956 was 1,600 barrels.

The output of natural gasoline and cycle products decreased slightly and that of LP-gases increased. Twenty natural-gasoline and cycling plants were active in Kern County during the year. Seven were in Bakersfield, 4 in Taft, 3 each in Maricopa and McKittrick, and 1 each in Tupman, Elk Hills, and Shafter. The largest plants were those of the Western Gulf Oil Co. at Bakersfield, the Ohio Oil Co. at Bakersfield, and the Richfield Oil Corp. at Tupman. These were the only two cycling plants in the State. The combined daily productive capacity of all natural-gasoline and cycling plants was approximately 1,500,160 gallons (32 percent of the State total) and the largest of any county in the State.

The quantity of natural gas from county fields utilized was 25 percent below that in 1955. One new wet-gas field was discovered and designated as the Shale Point area, with an initial daily flow of 3,550 thousand cubic feet.

The United States Borax & Chemical Corp. continued to be the leading borax producer in the State and in the Nation from its underground operation near Boron. The company also produced important quantities of other sodium compounds from the same material.

Portland cement was produced by Monolith Portland Cement Co. and the California Portland Cement Co. at Monolith and near Mojave, respectively. The Monolith plant operated five kilns, obtained gypsum from Ventura County, and mined limestone and clay locally. A minor tonnage of sandstone was quarried for rough architectural use by N. W. Sweetser near Rosamond.

The Groover Mining & Milling Co. quarried miscellaneous stone near Cantil for use as roofing granules, and the California Division of Highways contracted for the quarrying in the county of miscellaneous stone used for concrete and roadstone.

Nine firms produced sand and gravel, 1 gravel only and 1 sand only for aggregate. Shipments exceeded 1 million tons of sand and gravel, all hauled by truck. The major producing pits were near Bakersfield, Inyokern, Maricopa and Ridgecrest. The Federal Bureau of Reclamation and the California Division of Highways both contracted for production in the county of sand and gravel used as aggregate. The latter agency also quarried sand and gravel with its own crews.

Six producers quarried over 400,000 short tons of crude gypsite, principally for agricultural use. The product of the Superior Gypsum

Digitized by Google

Co. pit, near Lost Hills, was used both as an agricultural aid and as a cement retarder. Major production was by H. M. Holloway, Inc., near Lost Hills.

Miscellaneous clay was dug from pits near Mojave, McKittrick, and Rosamond for use in cement and drilling muds.

Sixty-six producers shipped nearly 60,000 pounds of tungsten concentrate, which averaged 63.3 percent $WO_3$. The major sources of this production were the ores of the High Peak mine near Inyokern, the Hard Luck mine near Randsburg, and the Victory group of claims near Red Mountain. Rene Engel and Associates planned to construct a tungsten mill near Weldon, and to develop 17 claims.

One placer mine (a small dragline operation in the *Randsburg* district) produced gold and silver. The Burton mill, equipped for custom cyanidation and flotation of gold and silver ores, was subsequently leased to Golconda Metals Co. Gold-silver fluxing ore was shipped to an Arizona smelter from the Silver Queen mine in the *Mojave* district. Lode properties that produced gold and silver by amalgamation of gold ores included the Porter group of claims in the *Clear Creek* district; Standard group of claims, *Mojave* district; Butte Lode, Mountain Lion operation, and Yellow Astor mines, *Randsburg* district; and the Peon claim in the *Sageland* district. A large percentage of the gold and silver yield and all of the small copper, lead, and zinc output credited to the county was recovered by cyanidation and smelting of cleanup material from the Burton mill in the *Mojave* district, operated by Burton Bros., Inc. The S. T. & G. Development Co. took over the operation of the Darmond Mining & Smelting Co. plant, 1 mile south of Rosamond, on a long term basis. The plant was operated 30 days during 1956 on gold and silver ores from the Bertha Ann group in the *Darwin* district, Inyo County.

The Long Beach Salt Co. produced salt by solar evaporation of brines near Randsburg. Small quantities of rhodonite and jasper were collected in the county as gem stone.

**Kings.**—Petroleum and natural gas continued to be the major mineral products in Kings County in 1956. The quantity of petroleum produced decreased 9 percent below 1955. The Pyramid Hills and part of the Kettleman Hills fields were the only producing areas. One crude-oil refinery—that of the Caminol Co. at Hanford—operated during the year. The throughput daily capacity of this plant was 5,000 barrels. Four natural-gasoline plants at Avenal had a combined daily production capacity of approximately 458,000 gallons—10 percent of the State total. Three of these plants were operated by Standard Oil Co. of California and one by P. S. Magruder. The quantity of utilized natural gas from county fields was 11 percent greater than in 1955. No new oil- or gas-field discoveries were reported in the county during 1956.

Minor quantities of sand and gravel were quarried in Kings County by crews of the California Division of Highways and an additional tonnage contracted for. The McPhaill Gypsum Co. produced crude gypsum for agricultural use from its quarry near Avenal.

The Fredanna and Little King mercury mines near Parkfield were productive during the year.

**Lake.**—Shipments of mercury produced in 1956 amounted to $645,000, or 78 percent of the total value of all minerals produced in

Digitized by Google

Lake County. California Quicksilver Mines, Inc., the county's principal producer, operated the Abbot mercury mine in the *Sulphur* district near Willow Springs. The company completed 2,866 feet of new drifts, developed a new ore body, and diamond-drilled 4,546 feet. Bradley Mining Co. recovered 672 flasks of mercury by furnace and secondary retort at the Sulphur Bank deposit near Clearlake Oaks. Other operating mercury mines were the Baker mine near Lower Lake and the Big Chief and Big Injun Groups, the Chicago, Helen, Joyce Prospect, Mirabel, and Wall Street mines near Middletown in the *East Mayacmas* district.

The Government-and-contractor sand and gravel output for roadstone used by the California Division of Highways and the Lake County Road Department decreased 33 percent in 1956 compared with 1955. The principal commercial producers of structural and paving sand and gravel were F. M. Frazell and Lange Bros., who operated pits near Kelseyville. Cache Creek Gravel Co. produced sand and gravel used for channel diversion and road construction between Cache Creek and the Wilson Valley Dam site.

V. V. Coleman prepared pumice and volcanic cinder from the Coleman quarry near Clear Lake Highlands, for use in fill, plaster, and soil conditioning.

About 260 long dry tons of manganese ore averaging 42 percent Mn and 2 percent Fe was shipped to a low-grade Government (GSA) depot from the Toy Young mine in Potter Valley, 30 miles northeast of Ukiah.

Members of the San Francisco Gem & Mineral Society gathered miscellaneous gem stones in the county, including 25 pounds of cinnabar, 200 pounds of obsidian, and 67 pounds of jasper.

**Lassen.**—The sand and gravel operations of Grayson Concrete & Materials near Janesville, Harms Bros. and George E. Miller in the Susanville area, and Lester L. Rice & Sons near Adin contributed considerably to the increased value of the county 1956 mineral production over 1955. The California Division of Highways, the United States Army Corps of Engineers, and the Modoc County Road Department also utilized structural and paving material produced in the county.

The higher output of basalt and miscellaneous stone and the increased use of granite for curbing and flagging explained the higher value of stone production in 1956 compared with 1955. The portable crusher operation of Lester L. Rice & Sons in the Susanville area yielded basalt for paving material. Susanville Marble & Granite Works, at Susanville, quarried gray granite for curbings; granite for riprap and roadstone was crushed at various localities in the county, by crews and contractors of the Lassen County Highway Department. The United States Forest Service utilized crushed miscellaneous stone in the Lassen National Forest for road repair. Mt. Lassen Cinder Co. quarried volcanic cinder near Susanville for concrete aggregate.

**Los Angeles.**—The quantity of petroleum from 44 producing fields increased slightly over 1955. During 1956, 18 crude-oil refineries were active in Los Angeles County, or slightly less than half of the 39 operating in the State. Six were in Long Beach, 4 in Wilmington, 2 in Torrance, and 1 each in El Segundo, Norwalk, Sante Fe Springs,

Digitized by Google

Paramount, Watson, and Newhall. The three largest were the Richfield Oil Corp. refinery at Watson, the General Petroleum Corp. refinery at Torrance, and the Standard Oil of California refinery at El Segundo. The combined daily throughput capacity of the county refineries was 790,400 barrels or 64 percent of the State total. The net increase in daily capacity during the year was 79,400 barrels.

The production of natural-gas liquids and cycle products was lower and that of LP-gases slightly higher in 1956 than in 1955. Twenty-six natural-gasoline plants were active in Los Angeles County in 1956, or about one-third of the 78 plants active in the State. Five of these were at Santa Fe Springs, 4 at Signal Hill, 3 each at Compton and Long Beach, 2 each at Inglewood and Newhall, and 1 each at Wilmington, Torrance, Castaic, Playa Del Rey, Seal Beach, Brea, and Los Angeles. The two largest plants were the Lomita Gasoline Co. of Long Beach and the General Petroleum Corporation at Wilmington. The daily productive capacity of Los Angeles County plants was approximately 1,097,300 gallons, or 23 percent of the State total. The quantity of utilized natural gas from county fields decreased 10 percent below the figure for 1955; 38 fields reported production.

Thirty-two firms produced and shipped over 26 million tons of sand and gravel, most of which was transported by truck. Major pits were near Littlerock in the northeast part of the county and near Irwindale, Arcadia, El Monte, and Azuza in the eastern portion. A relatively small tonnage of blast, engine, and filter sands was produced. Nearly 1 million tons of crushed granite was produced by 6 operators.

Over 800,000 tons of crushed miscellaneous stone was produced by 2 operators and over 23,000 tons of dimension miscellaneous stone was produced by 7 operators. The California Division of Highways, the Burbank City Engineer, the Glendale County Engineer, the Los Angeles Public Road Department, and the Los Angeles Water Power Department and their contractors, produced sand and gravel used as aggregate. The City of Burbank contracted for the quarrying in the county of granite used as riprap. The City of Los Angeles, Harbor Department, contracted for granite used as fill. The cities of Los Angeles and Long Beach contracted for miscellaneous stone used for concrete aggregate and road stone.

The Union Oil Co. of California and the Wilshire Oil Co. of California produced molten sulfur from crude oil at their refineries at Wilmington and Watson, respectively. The Hancock Chemical Co. purchased hydrogen sulfide and recovered molten sulfur in its sulfur plant at Watson. The Standard Oil Co. of California (with a refinery at El Segundo), and the Shell Oil Co. (with a refinery at Wilmington), recovered hydrogen sulfide from crude oil.

The Great Lakes Carbon Corp. prepared diatomite at its Walteria mill from crude obtained at the nearby company pit.

Portland cement was produced by the Blue Diamond Corp. in its Los Angeles plant, using purchased "clinker" as raw material.

Iodine was recovered at Dominguez by the Deepwater Chemical Co. from waste oil-well brines in the Dominguez oilfield.

Over 31,000 tons of miscellaneous clay was produced from pits near Reseda, Sunland, and Los Angeles, for local use in manufacturing of heavy clay products. Nearly 444,000 tons of miscellaneous clays,

Digitized by Google

mostly for brick manufacture at county plants, was dug from 11 other producing pits in the county.

A modest tonnage of soapstone was obtained from the Katz property near Acton.

Two placer mines in the *San Gabriel* district and one lode-gold mine in the *Neenach* district were in operation during 1959 and produced several hundred ounces of gold and silver.

The Kaiser Gypsum Co., Inc., imported gypsum, and Pabco Products, Inc., received gypsum from its Henderson (Nev.) property, for calcining at their board plants in Long Beach and Los Angeles, respectively.

A small tonnage of feldspar mined in San Bernardino County was custom-ground by the Kennedy Minerals Co. for a southern California brick manufacturer. The Sunshine Mica Co. ground mica of foreign and out-of-State origin at its Los Nietos plant for use in paint and as a roofing material. Although there was only 1 relatively small soapstone producer in Los Angeles County, 7 of the State's 15 talc-and soapstone-grinding plants were in the county.

**Madera.**—Natural-gas production in 1956 at the Chowchilla, Gill Ranch, and Moffat Ranch fields increased 19 percent compared with 1955.

The major producer of structural and paving sand and gravel was C. W. Stewart & C. E. Nuss, who operated their fixed plant at Herndon. Other producers of aggregate for building and paving were the San Joaquin Valley Pipe Co. at Chowchilla and Thompson Materials & Construction Co., Inc., and Valley Feed & Fuel Co. near Madera. Paving sand and gravel production was contracted for in the county by the Federal Bureau of Reclamation, the California Division of Highways, and the Madera County Road Commission.

In the Friant area California Industrial Minerals Co., Elmer Erickson, and Ol'Rebel Minerals, Inc., quarried pumicite from tuff layers for pesticide filler, concrete aggregate, and abrasives. Raymond Granite Quarries prepared monumental and rough building stone quarried near Raymond.

The principal tungsten producer in the county—the New Idria Mining & Chemical Co.—operated the Strawberry mine in the *Jackass* district; it yielded 143,300 pounds of concentrate averaging 71.3 percent $WO_3$. Other producers included United States Tungsten Co., Victory Ridge No. 2 mine, and Donald Trainer, San Joaquin mine, in the North Fork area; and Fagan Bros., Coarse Gold dump and Hazzett (Tin Bucket) mine near Coarse Gold and Oakhurst, respectively.

Gold and coproduct silver were recovered from the Chowchilla River bed at Werly Ranch by the suction dredge of the Sunshine Dredging Co. Delta Mining Co. and Multi Metals, Inc., operated the Jesse Belle mine and a 50-ton flotation mill in the *West Belt* (*Daulton*) district, on copper ore, during the early and latter part of 1956 respectively, and shipped copper concentrate containing gold and silver to out-of-State smelters.

**Marin.**—The value of stone production—double that of 1955—was the principal item in Marin County's mineral output. Marin Rock & Asphalt Co., Inc., produced crushed basalt at Novato for road use. Contractors produced about 70,000 tons of crushed miscellaneous

Digitized by Google

stone, which was used for fill by the California Division of Highways. Sandstone, crushed for riprap and road construction, was quarried near San Rafael by Basalt Rock Co., Inc., at the McNear Quarry, and by Hutchinson Co. at the Greenbrae quarry.

Paving gravel was prepared by Niles Sand & Gravel Co. at its Black Point plant and by Basalt Rock Co., Inc., near San Rafael. The California Division of Highways used paving sand produced locally by contractors. L. P. McNear Brick Co. utilized weathered shale produced from the open-pit deposit of The McNear Co. near San Rafael, for manufacturing of common brick.

The McNear Co. expended shale from the same deposit for use in lightweight aggregate. Perolite Products Co., Sausalito, expanded crude perlite produced in Nevada, for plaster and agricultural use.

Turner & McFarland retorted mercury from ore mined at the Gambonini property near Marshall. Floyd Edwards & Bros. operated in the same area on mercury ore from the Edwards mine until May, when Panco Mining Corp. subleased the mine and began installing equipment.

Members of the San Francisco Gem & Mineral Society gathered 100 pounds of petrified whalebone at Bolinas.

**Mariposa.**—The output of sand and gravel increased 17 percent in quantity compared with 1955, owing principally to the demand for paving sand. Mariposa Sand and Gravel Co. produced building and paving sand and gravel at the Mormon Bar plant and recovered some byproduct gold and silver in the process. Other production in the county was by Baun Construction Co., Inc., and Wm. J. Sayre, Sr., near Mariposa and crews of the California Division of Highways and from Yosemite National Park.

About 14,000 tons of granite was quarried and crushed for riprap and road repair by crews and contractors of the Yosemite National Park. Formation Logging Service Co. produced and dressed building stone from the Specimen Hill quarry at Bagby. Lee I. Rowland of Mariposa produced slate from the Aqua Fria Slate quarry, which was used for flooring and facing.

Incline Mining Co. (operating the Blue Dipper, Blue Spot, and Garnet Queen mines near El Portal) was Mariposa County's principal tungsten producer. The company also custom-milled ores from other mines in the county and from deposits in adjacent counties.

Several gold mines were active in the county during 1956, yielding modest quantities of gold and silver. Chris Mills operated the Red Banks mine near Coulterville and was the leading producer of gold and silver recovered by amalgamation of ore. Other operators who recovered gold and silver by amalgamation included, Clyde T. Foster (Sweetwater mine) in the *East Belt* district, and E. B. Cook Co. (Permit mine) and Formation Logging Service Co. (Specimen Hill mine), in the *Mother Lode* district. Copper and silver were recovered from gold ore mined and shipped by Mines Contracting, Inc., from the Spanish gold mine to a California smelter.

Members of the San Francisco Gem & Mineral Society collected 100 pounds of mariposite and ankerite near the Tuolumne County border south of Jacksonville.

**Mendocino.**—The value of the sand and gravel output comprised 81 percent of Mendocino County's mineral production. C. A. Haun &

Digitized by Google

Sons produced sand and gravel (from a pit 1½ miles east of Willits) which was used in building construction and paving. Other major producers were E. T. Baxman at Fort Bragg and Ukiah Gravel & Cement Co., Inc., at Ukiah. Contractors for the California Division of Highways produced 191,000 tons of sand and gravel used for road maintenance. About 18,000 cubic yards of granite was quarried, crushed and screened for road repair by the construction and maintenance crews of the Federal Bureau of Indian Affairs. The Mendocino County Highway Department and the California Division of Highways used 17,000 tons of crushed sandstone for their various road projects.

Cal Dri Ice Corp. produced natural carbon dioxide gas for manufacturing dry ice at Hopland. Operations were discontinued in October owing to the reported destruction of vegetable life by seepage from the well into the surrounding area.

Manganese ore was shipped by S & C Mining Co. from the South Thomas mine near Ukiah to a Government stockpile.

The Covelo Jade mines yielded 4,000 pounds of jade during 1956, and Carl Jansen and Clifford C. Zarley collected about 2,000 pounds of jasper near Covelo.

**Merced.**—The continued high demand for sand and gravel in building and paving resulted in a dollar value for this commodity above that of all other minerals produced in Merced County. The output of gravel increased 90 percent compared with 1955 and was 74 percent of the total sand and gravel produced in the county. River Rock, Inc., operating the Snelling fixed plant and the Atwater portable plant, was the principal producer of sand and gravel in Merced County, including gravel used for railroad ballast. The company recovered also some gold and the coproduct silver at the Snelling operation. Other producers with fixed plants were Le Grand Sand & Gravel at Le Grand, Los Banos Gravel Co. at Los Banos, Turlock Rock Co. at Ballico, and Valley Aggregates, Inc., at Cressey. Portable operations were conducted by Frederickson & Kasler at Le Grand and Roy Richardson at Los Banos.

Agricultural Minerals & Fertilizer Co. produced Agricultural-grade gypsum from the Ortigalita Creek gypsite deposit near Los Banos.

The Baroid Sales Division, National Lead Co. in its mill at Merced processed bentonite and ground barite, received from its own mines in California and Nevada, for use in well drilling mud.

Burgen & Olsen recovered mercury from ore mined in an extension of the old Stayton mine near the San Benito County border east of Hollister.

**Modoc.**—Structural and paving sand and gravel were supplied principally by Moyer Gravel Co. from pits at Alturas. Great Northern Railway Co. produced gravel for railroad ballast at Mammoth. Paving sand and gravel was prepared at various sites by Baldwin Contracting Co., Inc., Harms Bros., California Division of Highways, Alturas City Engineer, and the county road commission. Contractors for the California Division of Highways produced crushed basalt for roadstone on State Highway 139. Great Northern Railway Co. quarried volcanic cinder from the Ainshea Butte quarry near Mammoth, used for fill. The Tulelake plant of United States Pumice

Digitized by Google

Supply Co., Inc., at Newell, cut and trimmed pumice, quarried by the company in Siskiyou County, for use as scouring blocks.

Modoc Peat Moss Co. recovered hypnum peat moss from a bog in Jess Valley near Likely and shipped the material in bulk by truck and rail for use as a soil-conditioning agent.

Clifford C. Zarley gathered 3,000 pounds of obsidian gem material from the Davis Creek area in the northwest section of Modoc County.

**Mono.**—The value of concentrate recovered from tungsten ore mined in 1956 exceeded that of any other mineral produced in the county. Wah Chang Mining Corp. Black Rock mine was the second ranking producer in California. This company also operated a flotation-chemical plant in the *Chidago* district near Benton for treating company ore and concentrate. Nevada Consolidated Uranium, Inc., Nevada Minerals, and Vandee Tungsten, operated the Tungsten Queen mine in the *West Walker River* district near Coleville and were the other major producers of tungsten ore in the county.

Gold was recovered by amalgamating ore mined by George H. Totland at the Bright Star mine in the Cooney Lake area. Masonic Mine Association shipped gold ore, containing silver, from the Sarita group of claims in the *Masonic* district near Bridgeport, to a California smelter.

Andrew Boyd and Cowan & McGraw prepared pumice taken from quarries in the Benton and Bishop areas for acoustic plaster and concrete aggregate. The Lee Vining mill of United States Pumice Supply Co., Inc., trimmed and cut pumice from the Frank Sam mine for scouring blocks.

About 160,000 tons of paving gravel was prepared and used in Mono County as compared with 41,000 tons in 1955. Rice Bros., Inc., contractors for the California Division of Highways, the Mono County Road Department, and the United States Forest Service were active producers of sand and gravel in various sections of the county.

Huntley Industrial Minerals, Inc., mined over 14,000 tons of pyrophyllite at its Pacific Pyrophyllite mine in the *White Mountain* district and ground the material at Laws (Inyo County) for use principally in insecticides and paint. The company also produced kaolin-type clay at its Little Antelope deposit near Mammoth, and prepared it for use in paint and stucco in Inyo County.

About 6,000 tons of basalt was crushed and used for fill by crews of the California Division of Highways.

A. Hugh Dial collected 500 pounds of geode gem material at Hot Creek, east of Casa Diablo.

**Monterey.**—Petroleum in 1956 continued to have the highest value of all minerals originating in Monterey County. Production was limited to the San Ardo field and increased 7 percent in quantity over 1955, while natural-gas production in the county decreased 49 percent.

The Kaiser Aluminum & Chemical Corp. produced quick and hydrated lime for building, agricultural, refractory and chemical uses. Dolomite was quarried and calcined by the company at Natividad. Magnesia was produced from sea water and calcined dolomote in the Kaiser plant at Moss Landing.

Six firms produced sand and 2 gravel, with a total output of nearly 500,000 tons. The major active pits were near Pacific Grove, Seaside, Marina, and Castroville. About 200,000 tons of glass sand was

Digitized by Google

produced from the Pacific Grove, Seaside, and Marina pits by the Owens-Illinois Glass Co., the Del Monte Properties Co. and the Monterey Sand Co. Blast, engine, and filter sands were produced from the Pacific Grove and Seaside pits in addition to the output of aggregate sand. The California Division of Highways and the Monterey County Highway Department produced sand and gravel with their own crews. The former agency also contracted for the production, in the county, of these materials, which were used as concrete aggregate.

A minor tonnage of miscellaneous dimension stone was quarried in the Carmel Valley by Porter-Margvard for use in rough construction.

The Del Monte Properties Co. produced silspar, a silica-feldspar mixture, and ground feldspar at its plant near Del Monte.

The Monterey Bay Salt Works produced salt by solar evaporation of sea water near Moss Landing.

The Old Murray No. 1, near San Simeon, and the Patriquin group of mines near Parkfield in the southern part of the county, accounted for the modest output of mercury during the year.

A few pounds of jade and limestone were collected in the county for gem stone use.

**Napa.**—The value of stone production in the county exceeded that for any other mineral, and the quantity produced in 1956 was 49 percent above that in 1955. Basalt Rock Co., Inc., contractors for the California Division of Highways, and the Napa County Engineer, quarried and crushed basalt and miscellaneous stone near Napa for riprap, road construction, and fill. Frederickson Bros. operated a portable crusher near Monticello and prepared sandstone for concrete aggregate and roadstone. About 156,000 tons of sandstone was crushed and used for fill by the County Engineer and the Federal Bureau of Reclamation. Basalt Rock Co., Inc., prepared diatomite from its Pozzolan pit near Napa by drying, burning, and grinding it for use in pozzolanic cement. This company also bloated shale from Solano County at its Napa Junction plant for light aggregate.

Sand and gravel for building and paving was produced at the Benson gravel plant near Pope Valley and at various localities by R. A. Farick Co., Basalt Rock Co., Inc., and crews of the Napa County Engineer.

Perlite Aggregates, Inc., quarried and expanded perlite at St. Helena for use in plaster.

W. T. Kritikos and Vincent Yracabel et al., recovered mercury from ore at the Oat Hill mine dump in the *East Mayacmas* district, near Aetna Springs. Other producing mercury properties were the James Creek, Mad Money, Pope Creek, Toyon, and Vian mines, in the *Pope Valley* as well as the *East Mayacmas* districts.

Chromite ore and concentrate were shipped from the Grub Stake No. 1 claim in the *Pope Valley* district by Clyde Davis and from the White Angel group in the *Knoxville* district by David Chalmers to the Government (GSA) Grants Pass (Oreg.) Purchase Depot.

Changes and improvements during the year at the Phoenix mine of the Tabor Mining Co. near Monticello, limited its output of chrysotile asbestos to less than its contemplated annual output. The company produced a special grade of shorts used as a cement additive.

Digitized by Google

The Manhattan deposit leased by Cole's Mineral Co., in the *Knoxville* district, yielded several tons of onyx gem stone during 1956. Members of the San Francisco Gem & Mineral Society collected 67 pounds of jasper in the Putah Creek area.

**Nevada.**—Placer gold and silver production in Nevada County was primarily from small-scale operations of prospectors and itinerant miners. Empire Star Mines Co., Ltd., operated the Empire-North Star group of mines in the *Nevada City-Grass Valley* district and recovered gold and silver from company gold ore and concentrate from neighboring mines treated by amalgamation and cyanidation. Company operations were closed by a labor strike in July and remained shut down the remainder of the year. Other producers of gold and silver in the same district included Jack Sutherland (Little Fort Knox mine) and Willow Valley Mines, Inc. (St. Louis Tunnel mine).

The Baroid Division, National Lead Co., shipped crude barite from the Spanish mine near Washington to company plants in California and Texas.

Idaho-Maryland Mines, which discontinued gold mining in December 1955, worked its Brunswick mine in the *Grass Valley* district, concentrated the tungsten ore in the new company 100-ton gravity mill, and shipped the concentrate to the Toulon mill, Pershing County, for roasting and magnetic separation.

Paving gravel composed 74 percent of the total quantity of sand and gravel produced in the county. Major producers were Hansen Bros. on the Bear River, near Grass Valley, and crews of the Nevada County Highway Dept. at various locations in the county.

**Orange.**—Petroleum, LP-gases, and natural gas again in 1956 was the most valuable mineral product of Orange County. The quantity of petroleum produced was 11 percent less than the 1955 figures, and was from 16 producing fields. The Esperanza field was a discovery during the year. During 1956, 1 crude-oil refinery was active in Orange County—the Socal Oil & Refining Co. plant at Huntington Beach with a daily throughput capacity of 2,350 barrels.

Production of natural-gas liquids increased slightly, and the quantity of natural gas, withdrawn from 14 fields, decreased 32 percent. Nine natural-gasoline plants were active, with a daily combined production capacity of 517,994 gallons or 11 percent of the State total. Three of these were in Brea and two each in La Habra, Placentia, and Huntington Beach. The largest plants were those of the Signal Oil Co. at La Habra and the Standard Oil Co. of California at Huntington Beach.

Six firms produced sand and gravel, 7 sand only, and 1 gravel only, with a total output of nearly 4 million tons, nearly all of which was moved by truck. The pits that supplied the greatest yield were near Anaheim, Orange, Yorba Linda, Corona del Mar, San Juan Capistrano, El Toro, and Garden Grove. The pits at Corona del Mar and El Toro also produced minor tonnages of molding sand. The California Division of Highways and the Santa Ana City Engineer contracted for the production in Orange County of sand and gravel used as aggregate.

Small tonnages of iodine and iodine compounds were produced at Seal Beach by the Dow Chemical Co. from waste oil-well brines of the Seal Beach oil field.

Digitized by Google

Fire clay was dug from pits near Corona by Gladding, McBean & Co., and minor tonnages of miscellaneous clay were dug from pits at Huntington Beach and Tustin by La Bolsa Tile Co. and Pacific Clay Products, respectively. Near El Toro, I. P. Arnold produced a kaolin-silica sand mixture for use in refractory furnace lining and W. A. Schoeppe produced kaolin.

The Western Salt Co. produced salt by solar evaporation of sea water near Corona del Mar.

**Placer.**—The production of clays by Gladding, McBean & Co. and Lincoln Clay Products Co., Inc., in the Lincoln area, led Placer County's mineral output, in terms of value. The clays produced were sold or used principally for the manufacture of heavy clay products.

Gravel prepared for paving purposes comprised 79 percent of the total sand and gravel produced at various localities in the county, principally by Marshall & Miles Gravel Co. near Colfax, operations of the California Division of Highways, and the Placer County Road Department and their contractors at various locations.

Union Granite Co. quarried building and monumental granite and crushed stone for poultry grit and nursery fines at Rocklin.

Small-scale placer operations at various mines and prospects in the county yielded 304 ounces of gold and 27 ounces of silver. Additional gold and silver production came from the Gleason and Occidental drift mines in the *Iowa Hill* district, the Murdock (Lee) draft mine in the *Rocklin* district, the Rawhide mine dump in the *Dutch Flat* district, and the Bowman (Midnight Hill group of claims), in the *Foresthill* district.

Cliff Hills and Russell Powell shipped a few tons of chromite ore averaging 44 percent $Cr_2O_3$, from the Mountain View mine in the *Michigan Bluff* district near Michigan Bluff to the Government (GSA) Grants Pass, Oreg., Purchase Depot. Shipments were also made from the Foresthill area by Joseph Delmue (Daisy Bell mine), J. J. & Elsie B. Stephenson (The Eisenhower mine), Blake Teague (Pit Forty Seven), and Frank Turner, Paul Beatty and Cliff Hills (Two Cedar mine).

The Buckeye Mining Co. made a small shipment of tungsten concentrate from the Buckeye mine in the *Michigan Bluff* district.

Zimdars & Delmue handsorted and shipped 2 tons of ½- by 10-inch tremolite asbestos from the Noon-Day asbestos mine near Iowa Hill. The mine was sold at the close of the year to L. L. Anderson of Foresthill.

About 200 pounds of agate for gem stone was collected near Folsom by W. J. McPherson.

**Plumas.**—The sand and gravel output in Plumas County in 1956 was confined to Government-and-contractor operations of the United States Bureau of Public Roads, the California Division of Highways, and Plumas County Road Department. Paving gravel composed 82 percent of the total sand and gravel produced.

About 6,000 tons of miscellaneous stone used for riprap was quarried near Tobin by the Western Pacific Railroad Co.

William L. Ash shipped 361 long tons of manganese ore averaging 45.6 percent Mn from the Mt. Hough mine, in the Quincy area, to a Government stockpile.

Digitized by Google

[illegible] recovered a few ounces of gold and the coproduct silver [illegible] gravel at the Wartime 41 group of claims near Quincy. [illegible] shipped copper ore containing some silver from the [illegible] ore mine in the *Red Rock* district to a smelter.

Riverside. Kaiser Steel Corp. mined and shipped magnetite-hematite ore and concentrate from the Eagle Mountain mine and beneficiation plant to the company blast furnaces at Fontana. The shipments, including ore for export, increased 38 percent in 1956 compared with 1955.

Riverside Cement Co. produced general use and moderate-heat portland cement at its Crestmore plant. Of the raw materials used, gypsum and iron ore were purchased, and limestone, shale, and quartzite were obtained from company owned deposits in Riverside and San Bernardino Counties.

The increased demand for granite and miscellaneous stone accounted for the rise in the total quantity of stone produced in 1956 compared with 1955. The high production of crushed granite was from the Stringfellow quarry near Riverside, used for riprap by the United States Army Corps of Engineers. Other producers of granite included Guy F. Atkinson Co. at Ormand, Haven Granite Co. at West Riverside, and the National Quarries' Popcorn operation at Perris. The latter property was sold to the Riverside Builders Corp. as a location for housing development. Contractors for the California Division of Highways crushed 81,000 tons of granite, which was produced in the county for road building. Riverside Cement Co. quarried and crushed limestone at Crestmore for use as asphalt and fertilizer filler, as well as for cement.

Miscellaneous dimension stone was produced near Midland by California Limestone Product Co., J. W. Hannah, Jr., Jontz Stone Co., and L. Johnson and was used in both rough and dressed form for building construction. Over 500,000 tons of crushed miscellaneous stone was used by the California Division of Highways in the county for concrete aggregate and roadstone. Minnesota Mining & Manufacturing Co. crushed miscellaneous stone at Corona for use as roofing granules. California Limestone Products, J. W. Hannah, Jr., and Lawrence Johnson sold wollastonite float obtained from the Midland area, for use as ornamental building stone.

Glass sand was prepared by Owens-Illinois Glass Co. at its Corona plant. Other major producers that contributed to a high sand and gravel output for paving and building were Baun Construction Co., Inc., Massey Rock & Sand Co., and Valley Rock & Sand Corp. in the Indio and San Jacinto areas. W. E. Kier Construction Co. operated a sand and gravel pit and a portable concrete mix plant near the Palo Verde Diversion Dam.

The quantity of clays dug by Riverside Cement Co. from its Crestmore pits, for use in cement, made the company Riverside County's leading clay producer in 1956. Pacific Clay Products ranked second, as a result of its fire-clay output at Corona and Elsinore, followed by Gladding, McBean & Co. with deposits in the same areas. Pacific Clay Products used fire clay mined by contractors for heavy clay products.

United States Gypsum Co. quarried gypsum in the Little Maria Mountains near Midland, which was used in manufacturing plaster-

Digitized by Google

board. More-Lite Co. at Crestmore expanded crude perlite from the Klondike quarry in San Bernardino County, for plaster aggregate.

California Limestone Products, which operated the Blue Chief, Glory Hole, Langdon, and South Arlington mines in the *Ironwood* (*McCoy*) district northwest of Blythe, was California's principal shipper of manganese ore and concentrate to Government stockpiles. The ore and concentrate shipped from the Langdon mine alone had a value over $300,000. Aspen Mining Co. relinquished operating control of its mill (at Inca Siding near Blythe) to the Blythe Manganese Co. in May 1956. Both companies milled manganese ore from deposits operated by California Limestone Products and Roberts & Stewart in the Blythe area of Riverside County, and from deposits in Imperial County.

The New World tungsten mine in the Banning area operated by Wilbur Stark and the Orchid No. 2 mine operated by Grover Burgoyne in the *Chuckawalla* district near Desert Center yielded a modest quantity of tungsten concentrate. Other producers included John H. Tibbetts (Milky Way mine), also in the Banning area, H. T. Lucas Mining Co. (Pigeon Creek mine) in the Santa Rosa area, and Charles Reno (Red Ocher No. 2 mine) in the Maria area.

Except for the gold ore amalgamated at the Gold Standard mine in the Dale district by Berton Schwab, ores from the Wichita & Yellow Dirt mines in the *Bendigo* district, the Collins property in the *Corona* district, and the Rusty Gold mine in the *Dale* district were shipped to an Arizona smelter for treatment.

Herb Brown and the Desert Gem & Mineral Society collected fire agate in the Blythe and Coon Hollow areas, respectively. Harold Shugart and the San Gorgonio Mineral & Gem Society gathered chalcedony and geode for gem materials in the Wiley Well area.

**Sacramento.**—Natural gas continued to be Sacramento County's most valuable mineral product in 1956, although the quantity produced decreased 17 percent below the 1955 figure. It was withdrawn at the Freeport, the River Island, and part of the Thornton and Rio Vista fields. It was estimated that 61 percent of the production of the Rio Vista field, which also lies in Solano and Contra Costa Counties, was in Sacramento County. A new producing area known as the West Thornton field was discovered during the year.

Seven firms produced sand and gravel (3 gravel only and 1 sand only), with a total production of more than 3 million tons, almost all of which was moved by truck. The pits of major activity were along the American River near Sacramento and Fair Oaks. Contractors for the United States Bureau of Public Roads, the Federal Bureau of Reclamation, the California State Highway Commission, and Sacramento County produced sand and gravel used as aggregate in concrete.

Sacramento County, the second-ranking gold-producing county in California, had recoveries from two active placer operations during 1956. The Natomas Co., using a fleet of bucketline dredges, was much the largest single operator. In addition, 10 active sand and gravel operations recovered gold and silver as byproducts. The quantity of gold recovered from all operations was 37 percent and silver 30 percent of the total placer recoveries in the State. All production was from the *American River* (*Folsom*) district, where platinum was also recovered at the Natomas Co. dredging operation.

Digitized by Google

A small tonnage of fire clay was dug from various prospects in the vicinity of Michigan Bar by R. J. Robideaux, for use in the manufacture of stoneware, pottery, and heavy clay products. Miscellaneous clay was dug from pits near Michigan Bar and Sacramento by Cannon & Co. and Sacramento Brick Co., respectively.

The California Division of Highways contracted for the production, in the county, of crushed sandstone, basalt, and granite used in concrete aggregate and roadstone. The United States Army Corps of Engineers contracted in the county for the quarrying of miscellaneous stone for riprap.

**San Benito.**—The Ideal Cement Co. operated a four-kiln portland-cement plant near San Juan Bautista. Limestone and clay for the operation were obtained from local quarries. Crushed dolomite was produced by the Westvaco Mineral Products Co. from a quarry near Hollister for use in manufacturing fiberglass, and at its magnesia plant in Alameda County.

Sixteen mercury mines produced nearly 3,000 flasks of metal during the year—about one-third of the total for the State—most of which was produced in the *Idria* district by the New Idria Mining & Chemical Co.

The California Division of Highways and the County of San Benito contracted in San Benito County for the production of gravel used as aggregate. The latter agency also prepared paving gravel with its own crews.

A few hundred tons of chromite ore was produced and shipped from three small mines in the *Idria* district.

Petroleum production was small but greater than in 1955. Although production was limited to the Vallecitos and the Ciervo areas, there was a new discovery in the Flint Hills area during the year. Natural-gas production remained small but was about five times larger than in 1955, with the output limited to the Hollister and Vallecitos areas.

Benitoite and jadeite were collected near Idria as gem stones.

**San Bernardino.**—Three portland-cement plants were operated during the year, namely: The California Portland Cement Co., with a 9-kiln plant at Colton and quarries in the vicinity; the Riverside Portland Cement Co., with a 10-kiln plant at Oro Grande and a limestone quarry at Klondike; and the Southwestern Portland Cement Co., with a 9-kiln plant at Victorville and a limestone quarry at Black Mountain.

Crushed limestone was produced in the Victorville area and used for metallurgical flux and in whiting manufacture (filler). Quartzite was also produced in the same area and used in the manufacture of cement and refractories. W. C. Higdon quarried a minor tonnage of dimension quartzite near Twentynine Palms and the Lucerne Valley Engineering Co. quarried rough dimension granite near Lucerne Valley. Miscellaneous stone was quarried by three firms and used in making roofing granules, for rough construction, and as railroad ballast. The Federal Bureau of Reclamation and the National Park Service contracted in the county for the production of granite used as riprap, and the California Division of Highways contracted for crushed granite used as concrete aggregate and roadstone.

Digitized by Google

The American Potash & Chemical Corp. produced borax, soda ash, salt cake, potassium chloride and sulfate, lithium carbonate, phosphoric acid and bromine; and West End Chemical Co. produced borax, soda ash, and salt cake from brines at Searles Lake. The first named firm provided California's only production of lithium and potassium compounds. Dale Chemical Industries produced soda ash from dry-lake brines near Twentynine Palms.

Sixteen firms produced sand and gravel, with shipments totaling over 4 million tons. The largest pits were in the southwest corner of the county near Redlands, Colton, Monte Vista and Upland. The Federal Bureau of Reclamation, the National Park Service, the California Division of Highways, and the San Bernardino County Highway Department employed their own crews to prepare sand and gravel for highway construction and maintenance. The California Division of Highways also contracted in the county for the production of sand and gravel.

During 1956, 27 producers shipped over 500,000 pounds of tungsten concentrate that averaged better than 60 percent $WO_3$. This was 8 percent of California's yield for 1956, and the Atolia mine of the Surcease Mining Co. in the *Atolia* district supplied most of the output. Other important producing areas were in the vicinity of Adelanto and Barstow.

The Metropolitan Water District of Southern California and the Pacific Salt & Chemical Co. produced salt by the solar evaporation of brines near Rice and Trona, respectively, most of which was used for water-softening purposes. The California Salt Co. mined rock salt in an open pit near Amboy and produced liquid calcium chloride from well brines in the same area. The National Chloride Co. of America also produced calcium chloride from dry-lake brines near Amboy.

The output of talc was reported by 9 firms from 18 properties in the northeast part of the county near Baker and Tecopa, and pyrophyllite production was limited to 1 mine near Oro Grande. A high percentage of the output of these minerals, which were ground outside the county, was utilized as carriers for insecticides and as fillers for paints.

A small tonnage of ball-type clay was dug from 2 pits near Hart, 15 miles southeast of Ivanpah. Bentonite, for pharmaceutical use, came from pits near Daggett, Newberry, Vidal, and Yermo, and nearly 17,000 tons of miscellaneous clay was dug from pits near Hart, Highgrove, and Chino, and used in heavy clay products.

The California Portland Cement Co. produced quick and hydrated lime at its plant near Colton, and the West End Chemical Co. hydrated lime at its plant near Trona. The only 1956 production of rare-earth minerals in the State was of bastnaesite by the Molybdenum Corp. of America from its Mountain Pass mine near Nipton. The 1956 production of concentrate, although minor, was almost double that of 1955.

The Iron Age Mining Co. operated the Iron Age open pit mine in the *Dale* district and shipped to the Kaiser Steel Corp. at Fontana. The Mineral Materials Co. worked the Cave Canyon property in the *Cave Mountain* district and shipped iron ore to southern California cement producers.

Petroleum production was small, although over twice the 1955 figure. Two fields, the Chino-Soquel and the Mahala, supplied all

465877—58——16

Digitized by Google

of the county's production. Natural-gas production from the Chino-Mahala and Soquel areas was quite small, only about one-fourth of the 1955 production.

The California Perlite Corp. produced crude perlite from its quarry near Ludlow, sold mostly to builders in the Los Angeles area, who do their own expanding.

A single shipment of manganese ore (pyrolusite) was made from the Owl's Head mine, in the Owl Springs area.

The sources of the county's gold and silver output were, primarily: The Telegraph mine operated by Death Valley Panamint Mining Co., *Solo* district (gold-silver ore); the New Trail mine operated by Jumbo Cycles Sales, Inc., *Ivanpah* district (copper ore); and the Alexander mine operated by Al Anderson, *Dale* district (gold ore). The New Trail mine, previously mentioned, and the Horn group, operated by Glove Uranium, Inc., in the *Turtle Mountain* district, yielded most of the copper output from direct smelting ore. A high percentage of the lead and zinc output credited to the county was recovered from lead and lead-zinc ores mined in the *Kingston*, *Barstow*, and *Ord Mountain* districts and shipped to a smelter-fuming plant. Lippincott Lead Co. operated a smelter at Ontario on lead scrap and lead ore from its Lippincott (Lead King) mine in Inyo County. The entire smelter output was utilized in the manufacture of batteries. The Bear Creek Mining Co., subsidiary of Kennecott Copper Corp., did exploration for copper in the *Halloran Springs* district east of Baker.

Gene DeZan mined celestite (strontium sulfate) at the Jasper Jean mine 8 miles northwest of Ludlow and sold the output to a Nevada concentrator of manganese ore for use as a reagent. A small quantity of pumicite was produced by Williams Bros. Pumice Products, from its mine near Hinkley, and used as concrete admixture, and a large tonnage of volcanic cinder was mined near Ludlow by the Atchison, Topeka & Santa Fe Railroad for use as railroad ballast.

Eleven gem dealers reported the collection of specimens of rhodonite, agate, jasper, quartz, petrified wood, jadeite, opalite, amethyst, and chalcedony in the county.

A small tonnage of crude feldspar was produced by Gladding, McBean & Co. from its Beck mine, near Kramer Junction, and ground in Los Angeles County for use in the production of acid brick and fire brick. The United States Forest Service contracted, in the county, for the production of miscellaneous stone used as concrete aggregate and road stone.

**San Diego.**—The value of sand and gravel output was 74 percent of the total value of minerals produced in San Diego County and was 18 percent higher in 1956 than in 1955. Caudell & Johnson, with gravel plants near San Diego and Poway, continued to be the county's principal producer. Crystal Silica Co.'s plant at Talica Siding near Oceanside was the source of glass, molding, blast, and filter sand, in addition to sand for the building trades. Maurice N. Gross acquired a sand-preparation plant at Lakeside from Charles Arnell and continued its steady output of building sand.

The higher production of sandstone, basalt, and granite explained the greater quantity of stone produced in 1956 compared with 1955. Nelson & Sloan crushed basalt at its quarry and crusher operations

Digitized by Google

near Otay for concrete aggregate and roadstone. Granite for building and monuments was quarried by Clemens Granite Co. at Suncrest, by National Quarries at Vista, and by Escondido Quarries and Valley Granite Co. at Escondido. Broken and crushed granite was shipped for riprap, roadstone, and railroad ballast by V. R. Dennis Construction Co. from the Canyon Rock Co. quarry, by M. H. Golden Construction Co. and Kenneth H. Golden Co., Inc., at the Mission Gorge Plant, near San Diego, and by Einer Brothers, Inc., near Escondido. Arnt Carlson quarried 1,000 tons of irregular shaped quartzite from the Red Rose Variegated Quarry at La Cresta, for building construction.

At Chula Vista Western Salt Co. produced salt from sea-water ponds by solar evaporation, and Westvaco Chemical Division, Food Machinery & Chemical Corp., recovered magnesium chloride from sea-water bitterns. All of San Diego County's miscellaneous clay was produced near San Diego by Hazard Block Co., Sorrento Brick & Clay Prod., Inc., and Union Brick Co. and utilized for heavy clay products.

Shipments of tungsten concentrate from ore mined in the county was higher in 1956 than in 1955, although only 3 mines were active, compared with 8 mines that produced in 1955. The three operators were Dale Neubert (Black Diamond mine) in the *Campo* district, Virgil Deaver (Palomar Mtn. mine) in the Escondido area, and P-K Mining & Milling Co. (Pay-Off mine) in the San Ysidro area.

Excel Mineral Co. mined celestite from Pan-Chemical Co.'s Fish Creek Mountain mine, about 9½ miles south of Ocotillo for use as a chemical reagent.

A small quantity of gold was recovered by amalgamation from ore mined from the Ella Group by Robert S. Manning and from cleanup operations at the Rose Quartz mine and mill by J. S. Mahood.

Pyrophyllite, for use in insecticides and paint, was mined in the Rancho Santa Fe area by Harborlite Corp., Howard G. Golem, and Pioneer Pyrophyllite Producers.

Harborlite Corp. of Escondido, expanded perlite from San Bernardino County and Arizona for aggregate and filter aids.

L. B. Spaulding gathered 1,500 carats of spessartite garnet from a new deposit in the *Ramona* district. Other gem stones collected in the same area were tourmaline, topaz, and smokey quartz.

**San Francisco.**—Miscellaneous stone produced by Charles L. Harney, Inc., at the 7th Street Quarry was used mainly by the California Division of Highways as subbase material for roads. Stone removed from the Sunset Reservoir of the San Francisco Water Department was hauled and used as fill for Stanley Drive near Lake Merced.

The use of locally produced sand and gravel in the City and County of San Francisco increased during the year owing to paving and building projects of the Department of Public Works and the reservoir projects of the San Francisco Water Department. Material removed from the site of the underground exhibit hall in Civic Center was hauled and used for fill at Hunters Point.

Commercial Minerals Co. operated a grinding plant in San Francisco and ground talc and soapstone received from producers in El Dorado and San Bernardino Counties.

Digitized by Google

**San Joaquin.**—During 1956 natural gas was withdrawn from the Galt, Lodi, McDonald Island, Roberts Island, Tracy, Vernalis, and part of the Thornton gasfields. The major part of the Thornton gasfield is in Sacramento County. Production of sand and gravel increased 11 percent in quantity as compared with 1955, owing primarily to the high output of paving gravel by R. A. Fraish Co. at Linden, Pacific Cement & Aggregates, Inc. at Tracy, and Rice Bros., Inc. at Clements. The Federal Bureau of Reclamation, the California Division of Highways, and the County of San Joaquin and their contractors prepared sand and gravel for paving at various localities in the county.

Stockton Brick & Tile Co. and Stockton Building Materials Co. worked deposits of miscellaneous clay near Stockton for their own use.

**San Luis Obispo.**—The quantity of petroleum produced decreased 14 percent below that of 1955. During 1956 one crude-oil refinery was active in the county, the Union Oil Co. of California plant near Arroyo Grande. The daily throughput capacity of this plant was 21,500 barrels, including a capacity increase of 2,500 barrels in 1956. The San Luis Obispo portion of the Russell Ranch field was the source of most of the crude petroleum.

The natural gas utilized from 6 producing fields decreased 13 percent.

Eleven producers shipped over 5,000 long tons of chromite concentrate averaging less than 45 percent $Cr_2O_3$ and better than 2,000 long tons containing more than 45 percent. Most of the chromite ore was mined in the Santa Lucia Range north of San Luis Obispo. A new chromite mill, with a daily capacity of 25 long tons, was put into operation by the Castro Mining Co., the county's major producer, on the Morro Bay-Atascadero road.

Three firms produced sand and gravel, 1 firm gravel only, and 1 firm sand only, with a total output of over 70,000 tons in 1956. The active pits were near Oceano, Cambria, and Atascadero. Minor quantities of glass and molding sands were produced from the Cambria and Oceano pits, respectively. The California Division of Highways and the County of San Luis Obispo employed their own crews to quarry sand and gravel. The former agency also contracted in the county for the production of these materials.

Eaton and Smith produced crushed limestone at their Lime Mountain property for use in sugar refining. The Great Lakes Carbon Corp. produced a minor tonnage of miscellaneous stone, used as rubble, from the Abelaida quarry near Paso Robles, and the California Division of Highways contracted in the county for the stone and used it in concrete aggregate and as roadstone.

The Union Oil Co. of California recovered molton sulfur from crude oil at its petroleum refinery at Arroyo Grande.

A small tonnage of miscellaneous clay was dug from a pit near San Luis Obispo by Faulstich Bros., to be used in manufacturing common brick.

The Superior Gypsum Co. quarried gypsum near Simler for agricultural use.

Seven mercury mines produced over 100 flasks of the metal in 1956, most of which was from ores of the La Libertad mine in the *Paso Robles* district.

Digitized by Google

One small shipment of manganese ore was made in 1956, from the Johe Ranch mine, 6 miles southeast of San Luis Obispo, to a Government stockpile.

A dealer in rock specimens collected a small quantity of agate near Nipomo.

**San Mateo.**—The Ideal Cement Co. produced portland cement at its 4-kiln Redwood City plant and dredged oystershell and clay from San Francisco bay for raw material. Pioneer Shell Co. and South Bay Dredging Co. also dredged oystershell, part of which was used in mineral food and poultry grit. The Pacific Cement & Aggregates Co. operating the Brisbane quarry and the Lowrie Paving Co. operating the San Andreas quarry near Millbrae produced crushed sandstone principally for use as concrete aggregate and roadstone. McCammon-Wunderlich produced miscellaneous stone from the Whipple Road quarry near San Mateo and the California Division of Highways contracted for its production, used as fill.

The Challenge and the Farm Hill No. 2 mercury mines near Redwood City produced over 500 flasks of metal, almost all of which was the product of the Challenge Mining Co., which operated a furnace near San Francisco Bay.

Two firms produced sand from pits near South San Francisco and Rockaway Beach. The California Division of Highways and the City of South San Francisco contracted in the county for the production of sand and gravel. The latter agency used its own crews to prepare paving sand.

Petroleum production, although small, increased more than fourfold over 1955 and was limited to the La Honda and Oil Creek fields. The La Honda field was a discovery. Natural-gas production, also minor, from these two fields was 50 percent higher than the 1955 output.

A small quantity of jasper collected on beaches in the county was sold to dealers.

**Santa Barbara.**—The yield of crude petroleum from the 16 fields that produced decreased slightly in 1956 compared with the previous year. Two crude-oil refineries operated in the county during the year—that of the Union Oil Co. of California at Orcutt and of the Douglas Oil Co. of California at Santa Maria. Their combined daily throughput capacity was 6,700 barrels.

The production of natural gasoline and cycle products decreased slightly while the output of LP-gases increased. Six natural-gasoline plants were active during the year. Two each were at Orcutt and Santa Maria, 1 at Santa Barbara and 1 at Goleta. Their combined daily production capacity was approximately 106,400 barrels. The largest of these plants was that of the Union Oil Co. of California at Santa Maria.

The natural-gas output from 17 producing fields dropped 17 percent. The Cuyama South field was the largest gas producer in the county.

Four firms prepared and sold diatomite during the year. The Johns-Manville Products Corp., with quarries at Lompoc, was much the largest producer in the State. The company received an award, under the National Safety Competition conducted by the Federal Bureau of Mines, for an outstanding safety record at the Lompoc operation during 1956.

Digitized by Google

Three firms produced sand and gravel and one gravel only and shipped more than 400,000 tons from pits near Solvang, Santa Maria, and Lompoc. The Federal Bureau of Reclamation and the City of Lompoc produced sand and gravel with their own crews, and the California Division of Highways and the County of Santa Barbara contracted in the county for the production of these materials.

Miscellaneous stone was produced from the Santa Maria quarry 10 miles west of Sisquoc by G. Antolini & Sons and used for rough construction.

Modest tonnages of chromite ore and concentrate were shipped to a Government stockpile from the Corrales and Davis mines near Santa Ynez and Los Olivos, respectively.

Miscellaneous clay was dug from the San Marcos pit near Santa Barbara by McNall Building Materials for use in heavy clay products. Over 200 flasks of mercury were produced in 1956 from the Gibraltar group of claims in the *Santa Barbara* district and the Red Rock mine near Los Olivos in the *Santa Ynez* district. The Gibralter group produced most of the metal.

**Santa Clara.**—The Permanente Cement Co., with a 6-kiln plant at Permanente, was the largest portland-cement producer in the State in 1956. The company also produced masonry cement. Limestone and part of the clay requirements were obtained locally. Crushed limestone for concrete aggregate and roadstone was produced by Bahr and Ledoyen, Inc., in the Los Altos Hills. Oystershell was dredged in San Francisco Bay by the South Bay Dredging Co. for use in mineral food and poultry grit. The Santa Clara County quarry, southwest of San Jose, was the source of a substantial tonnage of crushed limestone used for road fill. Six firms produced miscellaneous stone from the Lone Hill and Neary quarries near Los Altos and from the Stevens Creek quarry near Cupertino, used as fill and for concrete aggregate and roadstone. The Naval Air Station, Moffett Field, contracted in the county for the production of miscellaneous stone used in surfacing taxiways and airstrips.

Twelve firms in the county produced and shipped nearly 1.5 million tons of sand and gravel from pits near San Jose, Gilroy, Los Altos, Los Gatos, and Campbell. The California Division of Highways and the City of San Jose contracted in the county for the production of sand and gravel used as aggregate.

Twenty-one mercury operations were active in the county during the year, yielding over 1,900 flasks of the metal, more than half of which was recovered from reworked dump material at Almaden. The Palo Alto Mining Corp. operated the Guadalupe, the Deep Purple, and Poison Oak mines, in the *Almaden* district, and the Hillsdale mine, south of San Jose.

James McPeters produced a minor tonnage of magnesite from his mine near Livermore, which was utilized by a manufacturer of magnesium compounds in Alameda County.

Several thousand tons of miscellaneous clay was dug from pits near San Jose by producers of heavy clay products.

A small quantity of jasper was collected near Morgan Hill for gem stone.

**Santa Cruz.**—The Pacific Cement & Aggregates, Inc., successor to the Santa Cruz Portland Cement Co., produced portland cement in

Digitized by Google

its Davenport plant (equipped with 3 Lepol and 4 rotary kilns) and used limestone quarried locally and shale obtained near Chittenden. Near Santa Cruz the Pacific Limestone Products Co. produced limestone for rubble and for use in poultry grit.

The Santa Cruz County Road Commission contracted in the county for the production of crushed granite used as fill. Six firms produced and prepared more than 700,000 tons of sand and gravel from pits near Santa Cruz, Felton, and Soquel. The California Division of Highways contracted for the production of sand and gravel, and the County of Santa Cruz used its own crews to produce gravel.

A minor tonnage of flue dust, containing potassium sulfate, from the Davenport cement plant, was marketed as a fertilizer material.

**Shasta.**—The Mountain Copper Co., Ltd., continued to be California's only producer of pyrite at its Hornet-Brick Flat open pit and Hornet-Richmond underground mine in the *Flat Creek* district. The pyrite was shipped to two sulfuric acid plants in the San Francisco Bay area.

Nine firms produced and shipped nearly 500,000 tons of sand and gravel from pits near Redding, Cassel, and Burney. The California Division of Highways, the Lassen Volcanic National Park, and the County of Shasta used their own crews to quarry gravel, and the Federal Bureau of Reclamation contracted for production of this material. The Shasta County Engineer contracted for a minor tonnage of basalt used as riprap, and miscellaneous stone used as concrete aggregate and roadstone. Volcanic cinder was quarried and processed for use as roadstone by three producers near Glenburn.

Roy S. Olson operated a placer mine by dragline in the *Igo* district. Two small lode-gold mines were active in the *Shasta* district and one each in the *French Gulch* and *Redding* districts. Modest quantities of gold and silver were recovered at each of the five operations. Flue dust shipped to a smelter-fuming plant from the old Afterthought (*Cow Creek* district) and the *Balaklala* (*Flat Creek* district) copper smelters, yielded considerable silver and several thousand pounds of copper, lead, and zinc.

The Phelps-Dodge Corp. signed an agreement with Shasta Copper & Uranium, Inc. calling for a minimum expenditure per year for a 5-year period on 250 mining claims in the *West Shasta* mining district 15 miles north of Redding. Shasta Copper & Uranium, Inc., completed one DMEA surface-drilling project in the *French Gulch* district, and a second DMEA drilling project was under way in the *Flat Creek* district.

The Castella Mining & Milling Co. milled chromite ore from the Lambert mine, in Butte County, at its Castella mill and trucked the concentrate to the Government (GSA) Grants Pass (Oreg.) Purchase Depot.

**Sierra.**—Gold and some silver were recovered from ore mined at the Original 16 to 1 mine in the *Alleghany* district by amalgamation and by smelting sulfide concentrate shipped to Selby, Contra Costa County. Best Mines Co., Inc., operated the Brush Creek underground mine and a 100-ton flotation mill 1½ miles in the *Downieville* district south of Goodyear Bar. Free gold and silver were recovered by amalgamation, and the concentrate was cyanided at the Empire Star mill in Nevada County. Six widely scattered placer operations,

Digitized by Google

principally small-scale hand methods, were active during the year and produced a modest quantity of gold and silver.

Sand and gravel production at various localities in the county, was limited to 5,200 tons of paving gravel prepared and used for road maintenance by crews of the California Division of Highways, as compared with 38,000 tons in 1955.

**Siskiyou.**—John Madsen, Thompson Pumice Co., and United States Pumice Supply Co., Inc., removed pumice and volcanic cinder from deposits in the Glass Mountain area for use as griddle blocks and concrete aggregate. Shastalite Cinder Block Co. quarried 2,250 tons of volcanic cinder for its own use in the Cinder Cone area, and McCloud River Lumber Co. removed pumicite from the Porcupine Ballast deposit, near Hambone for use as ballast in its logging railroad spurs and truck roads. Southern Pacific Co. quarried 329,000 tons of volcanic cinder from a deposit at Kegg for use as railroad ballast.

The output of sand and gravel was higher in 1956, in relation to 1955 figures, owing to the demand for paving gravel by the United States Bureau of Public Roads and the California Division of Highways. Portable plants were operated by Peter Kiewit Sons' Co. at Fort Jones and by Clements Construction Co. at Fort Jones and Tulelake. E. E. Schoonmaker operated a portable plant at Yreka and Mt. Shasta Gravel Co. continued to produce building sand and gravel at the fixed plant near Mt. Shasta.

The Siskon mine, operated by Siskon Corp., in the *Klamath River* district near Happy Camp, yielded 15,020 ounces of gold and 37,336 ounces of silver from gold ore treated. The company added a larger ball mill, and increased its cyanide plant capacity to 150 tons per day. The dragline dredge operation of the Scott River Dredging Co. at the Hayden deposit (in the Scott River area near Callahan) was the principal source of placer gold and silver.

Ashland Mining Co. Fairview mine, in the *Hamburg* district northwest of Hamburg, shipped chromite ore to its mill at Ashland, Oreg., and recovered 588 tons of concentrate containing over 45 percent $Cr_2O_3$. The company also custom-milled ore for several chromite producers in the county and shipped concentrate to the Government (GSA) Grants Pass (Oreg.) Purchase Depot. Other major producers of chromite included J. A. Richter (Gazelle Mtn. mine) in the Callahan area, and Virgil A. Grey (Dry Gulch Group) in the Cecilville area, J. H. Watkins and F. L. Merrill (Lady Grey and Seiad mines) in the McGuffy Creek area southwest of Scott Bar, and Ruth Robertson, who shipped 102 tons of ore and 6 tons of concentrate containing more than 45 percent $Cr_2O_3$ from the Cyclone Gap mine, in the Indian Creek area.

Stone production rose from 62,000 tons in 1955 to 110,000 tons during 1956, owing primarily to the higher output of sandstone and miscellaneous stone for concrete aggregate and roadstone. Crews of the Siskiyou County Engineer crushed basalt obtained in the immediate vicinity of the road repair projects. About 80,000 tons of miscellaneous stone was produced near Yreka by William Tregembo for use on the Yreka-Oberlin road. Construction and maintenance crews of the California Division of Highways also crushed miscellaneous stone and sandstone obtained locally for road projects. Roy's Rock Shop

Digitized by Google

collected 100 pounds of californite at Happy Camp; 25 pounds of nephrite was gathered at Indian Creek by Louis A. Sauers.

**Solano.**—Natural-gas production from eight producing fields decreased slightly below 1955 figures. A large percentage of the production came from the Solano County portion of the Rio Vista field, which also extended into Sacramento and Contra Costa Counties and was about 38 percent of the total field output.

Miscellaneous clay was dug from a pit near Vallejo by Basalt Rock Co., Inc., and bloated in Napa County for use as lightweight aggregate.

Five firms quarried over 400,000 tons of sand and gravel from pits near Rio Vista and Winters. The United States Bureau of Public Roads, the Federal Bureau of Reclamation, the California Division of Highways, the Solano County Road Department, and United States Army Corps of Engineers contracted for sand and gravel produced at various localities in the county.

A substantial tonnage of crushed limestone from a quarry near Rio Vista (used for road fill) and of crushed sandstone from the northwest corner of the county (used as concrete aggregate and roadstone) was produced for the Federal Bureau of Reclamation by contractors. Two rock-crushing plants near Thomassen and Benicia, produced minor tonnages of crushed basalt, used as concrete aggregate, and the Benicia Arsenal contracted the production of this material for the same use. A minor tonnage of miscellaneous stone was also quarried from the Solano Red Rock quarry near Benicia for use as concrete aggregate and roadstone, and the United States Army Corps of Engineers contracted for its production for the same end use.

**Sonoma.**—The Healdsburg fixed preparation plant of Basalt Rock Co., Inc., continued to be the source of major quantities of sand and gravel in the county. Construction Supply Co. prepared 96,000 tons of structural and paving sand and structural gravel at its Mirabel plant. Other producers included Cloverdale Ready Mix, Empire Rock Co., Inc., at Santa Rosa and Hein Bros. at West Windsor.

The combined production of basalt and miscellaneous stone increased from 235,000 tons in 1955 to 1,525,000 tons in 1956. Broken and crushed basalt for riprap, road fill, and railroad ballast, was produced by Basalt Rock Co., Inc., and Parish Bros., Inc., at Petaluma, and by Joe Ortega near Cotati. An important tonnage of miscellaneous dimension stone for building construction, rubble, and flagging was produced at Paul Cabrol's Valley of the Moon Quarry and J. B. Wingate & Son's Trinity Quarry at Glen Ellen and at Cliff Reed's Sonoma Stone Quarry and Santa Helena Stone Co.'s quarry, at Kenwood. Miscellaneous stone for riprap and road construction was quarried and crushed by Ben Gerrick Co., Thomas A. Graham at Occidental, and Charles Talbert, near Cotati. Joe Malugani sold crushed shale produced from a hillside occurrence at Mark West.

During the year Buckman Mines and Sonoma Quicksilver Mines, Inc., were the only shippers of mercury from the Buckman group of mines in the *West Mayacmas* district and the Mt. Jackson-Great Eastern mine in the *Guerneville* district, respectively. Both companies reported extensive long-range exploration and development.

Modest quantities of natural gas and crude petroleum were withdrawn from wells in the Petaluma area.

Digitized by Google

**Stanislaus.**—Sand and gravel production increased 57 percent in 1956 in relation to 1955 owing to the requirements for paving gravel by the California Division of Highways, County of Stanislaus, and the City of Modesto. The commercial demand for structural sand and gravel and paving gravel in the county was supplied by 7 fixed plants and 2 portable operations. The leading producer was Standard Rock Co., with a plant (fixed) at Oakdale and a new plant (fixed) 3 miles downstream from Knights Ferry.

A small quantity of byproduct gold and silver was recovered at the Oakdale plant. Others included American Sand & Gravel Co., Inc. (fixed plant), near Empire; Graystone Tile Sand Pit and fixed plant at Modesto; the Hughson Gravel Plant (fixed plant); M. J. Ruddy & Son (portable plants) at Oakdale and Waterford; and Chas. D. Warner & Son, Inc. (fixed plants) at Hickman and Empire.

Clayton & Lester Raggio produced and sold clay from the Knights Ferry clay pit for use in architectural tile.

Barium Products, Ltd., produced barium chemicals at Modesto, from crude barite obtained at its Nevada mines, used in the manufacture of glass.

Del Puerto Mining Co. shipped chromite concentrate averaging 46 percent $Cr_2O_3$ from its Del Puerto mine in the *Red Mountain* district 24 miles west of Patterson.

Josef Odermatt retorted mercury from ores of the Adobe open-pit and underground mine, also in the *Red Mountain* district.

**Sutter.**—Natural-gas production decreased slightly from 1955 at the Marysville Butte field, the only producing gasfield in the county.

Six firms quarried about 100,000 tons of sand and gravel at pits near Sheridan, Live Oak, and Wheatland. The California Division of Public Roads, and the United States Army Corps of Engineers contracted for the production of paving sand and gravel, and Sutter County quarried gravel with its own crews, used in road construction and repair.

A minor tonnage of miscellaneous clay was dug from a pit near Nicolaus by Gladding, McBean & Co. for use in heavy clay products at its Placer County plant.

**Tehama.**—Natural-gas production in 1956 was limited to the Corning and Corning South gasfields.

Red Bluff Sand & Gravel Co. produced 87,000 tons of structural and paving sand and gravel in its fixed plant at Red Bluff. Allen & Reddy Sand & Gravel operated three portable plants near Red Bluff, and Globe Builders Supply, Inc., operated a fixed plant at Richfield, north of Corning, and prepared structural gravel. Government-and-contractor operations in the county by the California Division of Highways, Lassen Volcanic National Park, Tehama County, and United States Army Corps of Engineers produced paving sand, and building and paving gravel, from various locations in the county.

Crews of Lassen Volcanic National Park used dimension basalt, produced locally, for rubble, and the Federal Bureau of Reclamation contracted for miscellaneous stone used for riprap and produced from occurrences along the Sacramento River.

Digitized by Google

Beegum Mining Co. operated various chromite deposits in the *Beegum-Tedoc* district south of Platina, milled the ore, and shipped concentrate to the Government (GSA) Grants Pass (Oreg.) Purchase Depot. L. B. Duffin and Utah Chrome Co. also shipped chromite ore from the same area. Dave Brundage and Richland Mining Co. shipped chromite ore from the Grau and Kleinsorge leases in the *Elder Creek* district southwest of Red Bluff.

**Trinity.**—Sand and gravel was produced along the Trinity River by Arbuckle & Garrison at Lewiston, Trinity Sand & Gravel Co. near Douglas City, and at various projects of the California Division of Highways. Although modest quantities of structural, paving, and filter sands were prepared from pits near Douglas City, the demand was mostly for paving gravel.

About 5,300 tons of crushed miscellaneous stone and 3,000 tons of crushed sandstone, produced at various localities in Trinity County, was used by the California Division of Highways for road projects.

The principal production of placer gold and silver was from the bucketline dredge operation of Fairview Placers near Lewiston. C. M. Bennett worked the Bennett mine, in the *Trinity River* district near Big Bar, by hydraulic method and recovered 43 ounces of gold and 5 ounces of silver. The yield of lode gold and silver were mainly from the Layman mine, in the *Hayfork* district and from the Beat Tooth mine in the New River area near Denny. Copper ore containing silver was mined at the Rainbow mine by Hoover Drilling Co., in the *Trinity River* district near Trinity Center and shipped to a smelter.

Manganese ores with an average analysis of 45 percent Mn were shipped from the Ruth area to Government stockpiles by Walter Wells and Pat Jordan (Barry Creek mine), R. W. Matthews and Ray Pearson (Pearson mine), and K. P. F. & F. Mining Co. (Trout Creek mine).

Lee Chapman (Cedar mine) in the Crow Creek area, Starr Bee Mines (Redskin mine) in the Oak Ridge area, and Liston Ehorn (Shamrock mine) in the Dubakella Mountain area near Wildwood shipped chromite ore to the Grants Pass, Oreg. depot.

Philip Munko retorted 12 tons of cinnabar ore and recovered 4 flasks of mercury at the Altoona mine in the Trinity River area near Castella Creek. The mine was also operated by Austin & Smith. Other mercury producers in the same area were A. Y. Cripps (Lilly mine), and the Integral Mining Co. (Integral mine).

**Tulare.**—The quantity of petroleum produced during the year was small and decreased 16 percent below 1955. The Deer Creek field was the only producing oilfield in the county. Natural-gas production about equaled the 1955 output; all of it came from the Tulare County portion of the Trico gasfield, which also lies in Kings and Kern Counties. The quantity credited to this county was estimated at 77 percent of the field's total production.

Five firms quarried over 500,000 tons of sand and gravel from pits near Porterville and Lemon Cove. The Federal Bureau of Reclamation and the California Division of Highways both contracted in the

Digitized by Google

county for the production of paving sand and gravel. The latter agency also used its own crews to produce and prepare paving sand used in highway construction.

Over 200,000 pounds of tungsten concentrate, containing an average of 63 percent $WO_3$, was recovered from the ores of 44 active mines in 1956. The leading producers were; Claud Rouch Sr. and Jr., with mines in the Cottonwood Creek area near Orosi, National Tungsten Co., with mines in the Deer Creek and Kern River areas, and Tulare County Tungsten Co. with a mine in the Kawean River area near Lindsay.

The Federal Bureau of Reclamation contracted in the county for miscellaneous stone used as riprap, and the California Division of Highways contracted for the stone, which was used as concrete aggregate and for roadstone.

A minor tonnage of miscellaneous clay was dug from a pit near Exeter by S. P. Brick & Tile Co. and used in the manufacture of common brick.

The Macco Corp. quarried a small tonnage of crude barite from the Barite King group of claims in the Chimney Peak area and ground the material at its Rosamond plant in Kern County.

A dealer in gem stones collected a small quantity of rock crystal in the Sequoia National Forest.

**Tuolumne.**—Gravel used for fill and structural purposes (produced by Tri-Dam Constructors at Strawberry) increased the output of sand and gravel in 1956 compared with 1955. Other sand and gravel producers in Tuolumne County included A. P. Jones, Beerman & Jones, M. J. Ruddy & Son, and Stewart & Prothero operations in the Sonora and Chinese Camp areas.

The increased production of sandstone and miscellaneous stone for concrete aggregate and roadstone explained the rise in total stone production in 1956 compared with 1955. Sonora Marble Aggregates Co. produced limestone for rough construction, fill and poultry grit, and marble for terrazzo from its own quarries near Sonora. Geo E. France, Inc., contractor, produced crushed limestone from the quarries of United States Lime Prod. Corp. near Columbia and Sonora, and used by the latter in lime manufacture, and for chemicals used in glass, for filler, and in mineral food. Government-and-contractor operations of the South San Joaquin and Oakdale Irrigation Districts, and the Tuolumne County Road Commission produced and utilized 654,000 tons of miscellaneous stone and 3,500 tons of crushed sandstone for concrete aggregate and road material.

United States Lime Products Corp. at Sonora, which became a wholly-owned subsidiary of the Flintkote Co. in September, produced quick and hydrated lime for building, chemical, and industrial use and hydrated lime for agriculture.

High Sierra Scheelite Co. operated the High Sierra tungsten mine in the *Dorothy Lake* district near Pine Crest and was the only shipper of tungsten ore and concentrate in the county.

Gold and silver were recovered by amalgamation in the *East Belt* (*Big Oak Flat*) and *Mother Lode* (*Columbia*) districts, from the Grand

Digitized by Google

Turk mine, operated by William J. Rule, and the Eureka (Grizzly-Eureka) mine, operated by Charles F. Harper, respectively.

**Ventura.**—Petroleum continued to be much the most valuable mineral product of Ventura County. The 1956 output, from 27 producing fields, decreased slightly below 1955. Three of four crude-oil refineries active were at Oxnard and the other at Ventura. The largest of these was that of the Seaside Oil Co. at Ventura. The combined daily throughput capacity was 8,500 barrels.

The yield of natural gasoline and cycle products decreased slightly, while the output of LP-gases increased compared with 1955. Nine natural-gasoline plants were active, with a daily combined production capacity of approximately 771,400 gallons—16 percent of the State total. Seven of these were in Ventura and two in Fillmore. Much the largest operation was that of the Shell Oil Co. at Ventura.

Natural gas was produced at 24 fields in the county, and the output utilized decreased slightly below the 1955 figure.

Four firms produced over 1.5 million tons of sand and gravel from quarries near Santa Paula, Ventura, Saticoy, El Rio, and Montalvo. The California Division of Highways contracted in the county to produce over 1 million tons of paving gravel used in highway construction and repair. Limestone (shells) from the Tapo Alta deposit near Santa Susana was crushed by the Western Lime Products Co. and used in manufacturing whiting and agricultural products and in mineral food and poultry grit. Miscellaneous clay was dug from pits near Frazier Park and bloated for use as lightweight aggregate. Clays from Ventura were used as drilling muds. The Monolith Portland Cement Co. quarried gypsum near Cuyama for use as a cement retarder at its Kern County plant.

**Yolo.**—Structural and paving sand and gravel were produced by Pacific Cement & Aggregates, Inc. at Yolo and by Schwarzgruber & Sons, A. Teichert & Son, Inc., and Mrs. Lucy L. Woods, near Woodland. The Federal Bureau of Reclamation at Monticello Dam, the California Division of Highways, the United States Army Corps of Engineers, Yolo County, and crews of the Sutter County Road Commission and their contractors produced sand and gravel for building and paving use at various localities in the county.

The United States Army Corps of Engineers also used 36,000 tons of miscellaneous stone, obtained from local occurrences, for riprap. Contractors for Travis Air Force Base and the Federal Bureau of Reclamation produced 2,650 tons of crushed sandstone used for road construction and as fill material.

Natural gas was withdrawn at the Dunnigan Hills, Pleasant Creek, Sycamore Slough and part of the Winters gasfields; a portion of the Winters gasfield is in Solano County.

**Yuba.**—Yuba Consolidated Gold Fields, California's principal gold producer, operated a fleet of electrically controlled bucketline dredges and worked gravels in the Yuba River Basin near Hammonton. The company also recovered silver, in combination with the gold and platinum. The balance of Yuba County's gold and silver output was obtained by small-scale operations in the *Bear River*, *Camptonville*,

Digitized by Google

*Challenge*, and *Dobbins* districts and as a byproduct at the Hallwood Gravel Plant of Baldwin Contracting Co., Inc.

Sand and gravel output increased 41 percent in 1956 compared with 1955 owing to an increased demand for structural and paving gravel. Major tonnages of these materials were produced by Baldwin Contracting Co., Inc., Lester Rice & Son, and Yuba River Sand Co., from deposits along the Yuba River. Additional tonnages of structural sand and structural and paving gravel were prepared by contractors for the Sutter County Road Commission, the United States Army Corps of Engineers, and the County of Yuba.

Miscellaneous clay was dug at the Wheatland pit by Gladding, McBean & Co. for heavy clay products manufactured at its Placer County plant.

Digitized by Google

# The Mineral Industry of Colorado

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker[1]

IN 1956 Colorado produced minerals valued at $329 million, including $12 million for uranium, compared with $286 million, excluding uranium, in 1955. Larger output of petroleum from the Rangely field and the still growing Denver-Julesburg basin and a production increase of natural-gas liquids from new plants, plus a higher unit value for molybdenum that offset a production drop plus an inclusion of a value for uranium production, were the factors primarily responsible for the $43 million increase in 1956.

Important increases in value were also reported for the base metals, whose production was stimulated by higher prices; for vanadium, whose production was closely allied to an increasing uranium output; for sand and gravel, which was in greater demand by the construction industry; and for stone, which was affected by a higher unit evaluation of captive limestone.

For one-third of the commodities produced in the State, lower values were reported for the year, but the combined decrease was less than $2 million. Tungsten production was reduced 24 percent because lower grade material was treated by the major producer and because the Government purchase program lapsed. Silver output declined, in spite of generally higher base-metal production, because production of silver-bearing copper ore at a major operation was smaller. A small decrease in the demand for coking coal within the State caused a 2-percent drop in coal production.

Activity in the uranium industry continued on an increasing scale, and some production and reserve data were released by the Atomic Energy Commission (AEC). Colorado's share of the domestic uranium industry included 6.8 percent of the reserves, 18 percent of the mine production (FY 1956), and 25 percent of the milling capacity.

Interest in oil-shale deposits increased during the year. The Federal Bureau of Mines plant at Rifle was closed in June; however, experimental work was carried on by at least three private concerns.

Considerable interest was also shown in some of the less common metals—beryl, columbium and tantalum, and the rare-earth metals—although production remained relatively small.

Antimony, arsenic, bismuth, cadmium, and selenium were recovered from Colorado ores; but, because the quantities were small and not accounted for in early metallurgical processing, no quantitative data are available.

**New Plants and Construction.**—Several new plants and facilities were completed during 1956. A $2.5 million plant at Florence was completed for the production of wallboard, sheathing, and lath from gypsum mined in Fremont County. At Rico a flotation plant to treat tailings for pyrite was constructed. Of importance to natural-gas producers in western counties was completion of the Pacific Northwest

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.



Digitized by Google

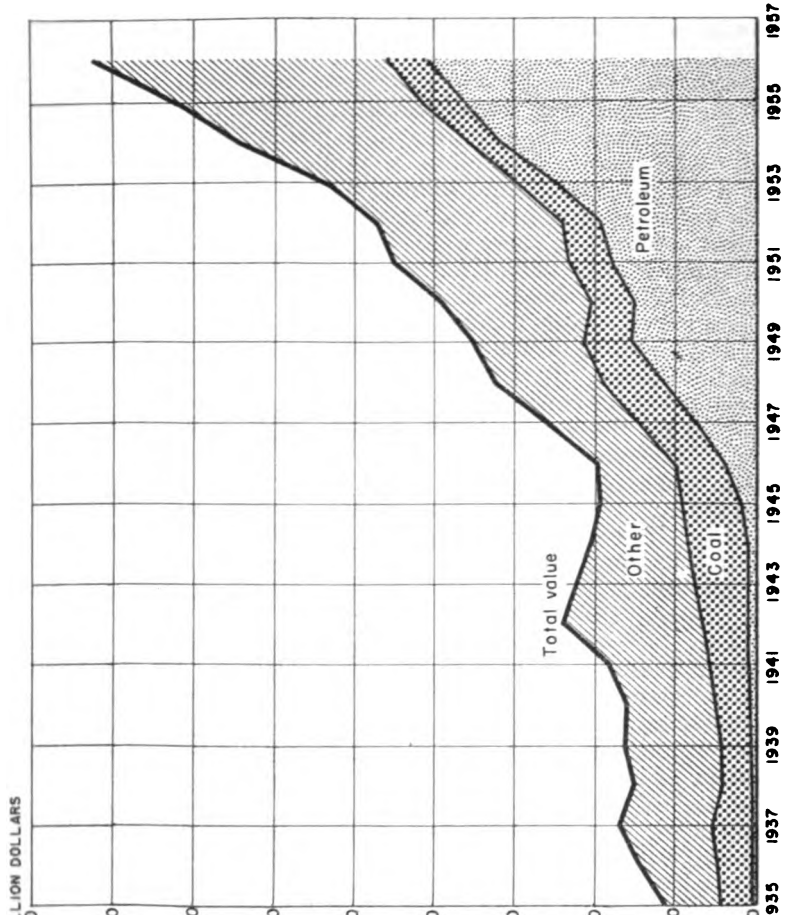



FIGURE 1.—Value of petroleum, coal and total value of all minerals produced in Colorado, 1935–56 (excludes uranium 1941–55).

Digitized by Google

## TABLE 1.—Mineral production in Colorado, 1955–56 [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Beryllium concentrate.....gross weight | 46 | $22,950 | 179 | $93,748 |
| Clays | 464,231 | 1,117,901 | 522,573 | 1,215,305 |
| Coal | 3,567,930 | 20,100,174 | 3,502,163 | 19,831,818 |
| Columbium-tantalum concentrate.....pounds | 4,325 | 7,254 | 52 | 32 |
| Copper (recoverable content of ores, etc.) | 4,323 | 3,224,958 | 4,228 | 3,593,800 |
| Feldspar.....long tons | 46,114 | 313,716 | 47,014 | 327,276 |
| Gem stones | [2] | 48,000 | [2] | 30,000 |
| Gold (recoverable content of ores, etc.)..troy ounces | 88,577 | 3,100,195 | 97,668 | 3,418,380 |
| Gypsum | 76,649 | 329,321 | 88,026 | 352,761 |
| Iron ore (usable).....long tons, gross weight | 3,666 | [3] | [3] | [3] |
| Lead (recoverable content of ores, etc.) | 15,805 | 4,709,890 | 19,856 | 6,234,784 |
| Mica: | | | | |
| Sheet.....pounds | | | 8 | 126 |
| Scrap | 699 | 12,596 | 517 | 7,596 |
| Natural gas.....million cubic feet | 49,152 | 4,866,000 | 54,205 | 5,312,000 |
| Petroleum (crude).....thousand 42-gallon barrels | 52,653 | 144,800,000 | 58,516 | 162,674,000 |
| Pumice | 70,530 | 162,605 | 50,015 | 109,206 |
| Rare-earth metals concentrates.....pounds | [3] | [3] | 32,145 | 23,152 |
| Salt (common) | 3,688 | 17,400 | [3] | [3] |
| Sand and gravel | 12,911,783 | 8,914,429 | 15,152,000 | 11,081,625 |
| Silver (recoverable content of ores, etc.)..troy ounces | 2,772,073 | 2,508,866 | 2,284,701 | 2,067,770 |
| Stone | 2,149,019 | 3,508,053 | 2,250,168 | 5,216,641 |
| Tungsten concentrate.....60-percent $WO_3$ basis | 1,152 | 4,079,341 | 873 | 3,010,074 |
| Uranium ore | [4] | [4] | 495,450 | 12,000,000 |
| Vanadium (recoverable content of ores, etc.) pounds | 4,595,359 | [3] | 5,582,484 | [3] |
| Zinc (recoverable content of ores, etc.) | 35,350 | 8,696,100 | 40,246 | 11,027,404 |
| Value of items that cannot be disclosed: Carbon dioxide, cement, fluorspar, molybdenum, natural-gas liquids, perlite, pyrite, tin (1955), and values indicated by footnote 3 | | [5] 76,969,285 | | 83,595,653 |
| Total Colorado [6] [7] | | [7] 286,219,000 | | 329,450,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration purchase depots is excluded.
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[4] Excludes uranium; uranium figure for 1955 not released by Atomic Energy Commission.
[5] Revised figure.
[6] The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.
[7] Excludes uranium as indicated in footnote reference 4.

## TABLE 2.—Average unit value of selected mineral commodities in Colorado, 1955–56 [1]

| Commodity | 1955 | 1956 | Commodity | 1955 | 1956 |
|---|---|---|---|---|---|
| Beryl.....short ton | $498.913 | $523.732 | Natural gas thousand cubic feet | $0.099 | $0.098 |
| Clays.....do | 2.408 | 2.326 | Petroleum [4].....42-gallon barrel | 2.750 | 2.780 |
| Coal.....do | 5.634 | 5.663 | Pumice.....short ton | 2.305 | 2.183 |
| Columbium-tantalum pound | 1.677 | .615 | Sand and gravel.....do | .690 | .731 |
| Copper [2].....do | .373 | .425 | Silver [5].....troy ounce | +.905 | +.905 |
| Feldspar.....long ton | 6.803 | 6.961 | Stone.....short ton | 1.632 | 2.318 |
| Gold [3].....troy ounce | 35.000 | 35.000 | Tungsten.....short ton unit | 58.997 | 57.472 |
| Gypsum.....short ton | 4.296 | 4.007 | Zinc [2].....pound | .123 | .137 |
| Lead [2].....pound | .149 | .157 | | | |
| Mica: | | | | | |
| Sheet.....do | | 15.750 | | | |
| Scrap.....short ton | 18.020 | 14.692 | | | |

[1] Based on average value f. o. b. mines or mills reported by the producers, except as otherwise noted.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Value at wells.
[5] Treasury buying price for newly mined silver July 1, 1946 to date—$0.9050505.



Digitized by Google

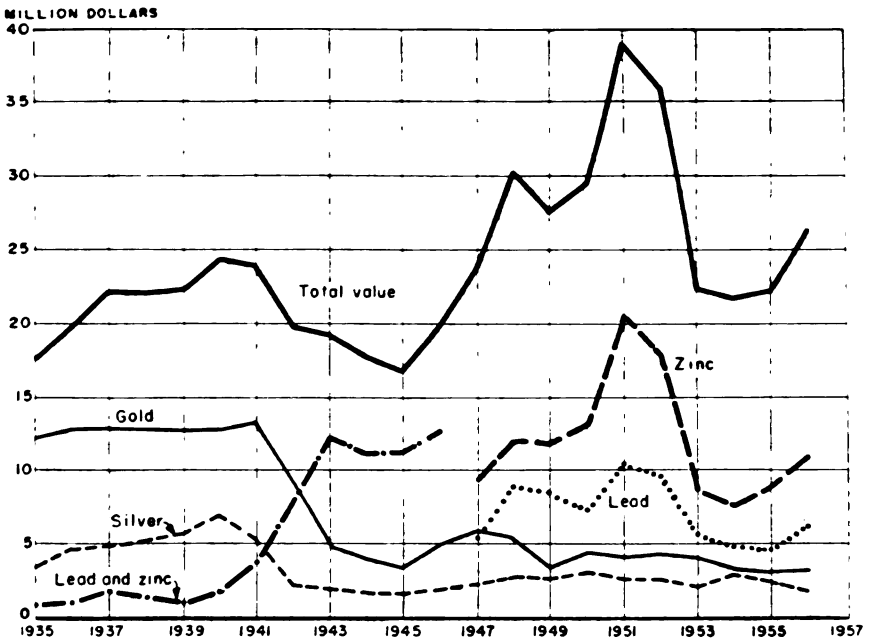



FIGURE 2.—Value of mine production of gold, silver, lead and zinc and total value of gold, silver, copper, lead, and zinc in Colorado, 1935–56. The value of copper has been less than $2,000,000 annually, except for 1937–40 and in 1954.

pipeline, which will provide a market outlet for natural-gas reserves. A new brick plant in Denver was also erected and was of interest because of the high degree of automation involved. At the year end, a new uranium mill at Rifle and a shale-oil pilot plant at Grand Valley were under construction.

**Employment and Earnings.**—Employment in Colorado mineral industries accounted for 3.5 percent of all nonagricultural employment during 1956 and increased 7 percent over the preceding year (total nonagricultural employment rose 5 percent over 1955). Gross average weekly earnings for all mineral industries rose from $90.72 in 1955 to $97.70 in the current year. Detailed data on employment and earnings are presented below and were supplied by the Bureau of Labor Statistics:

| Industry | Average employment | | Average hourly earnings, 1956 | Average weekly hours, 1956 | Average weekly earnings, 1956 |
|---|---|---|---|---|---|
| | 1955 | 1956 | | | |
| Total nonagricultural | 433,200 | 456,700 | | | |
| Total mining | 14,900 | 16,000 | $2.36 | 41.4 | $97.70 |
| Metal mining | 5,700 | 6,400 | 2.26 | 43.7 | 98.76 |
| Coal mining | 2,600 | 2,500 | 2.76 | 34.1 | 94.12 |
| Petroleum and natural gas | 5,900 | 6,300 | 2.38 | 42.2 | 100.44 |
| Other mining and quarrying | 700 | 800 | | | |

Average employment includes all full- and part-time workers below the administrative level. Average earnings are gross earnings and include overtime pay, night differential, and special incentive pay

Digitized by Google

TABLE 3.—Defense Minerals Exploration Administration contracts executed in 1956

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date 1956 | Total amount | Government participation percent |
| *Boulder* | | | | | |
| Elmer Hetzer et al | Pennsylvania mine | Tungsten | Feb. 21 | $16,100 | 75 |
| Jimtown Uranium Co | Victory, Lulu, and Gold Leaf Lode claims. | Uranium | Apr. 18 | 16,000 | 75 |
| *Fremont* | | | | | |
| Josey & Roper et al | Big Bear et al. claims | do | Mar. 29 | 39,596 | 75 |
| *Gunnison* | | | | | |
| G. R. Bennett et al | High and Mighty group. | Lead-zinc | Oct. 23 | 24,030 | 50 |
| *Gunnison and Saguache* | | | | | |
| Vulcan Silver-Lead Corp | Indian Creek group | Uranium | Aug. 3 | 160,369 | 75 |
| *Jefferson* | | | | | |
| Grapevine Mines, Inc | Grapevine mine | do | Oct. 30 | 16,600 | 75 |
| *Mesa* | | | | | |
| American Leduc Uranium Corp | Outlaw Mesa mine | do | July 23 | 23,944 | 75 |
| Lee E. Cox & T. R. Gillenwaters | Okan mine | do | Aug. 22 | 19,960 | 75 |
| Hamilton et al. and Simpson Mining Co.[1] | Beaver Mesa group | do | Aug. 1 | 291,510 | 75 |
| *Mineral* | | | | | |
| Gormax Mining Co | Gormax mine | Lead-zinc | Mar. 22 | 56,720 | 50 |
| Outlet Mining Co. and Sublet Mining Co. | Outlet mines | do | Feb. 23 | 108,506 | 50 |
| *Montrose* | | | | | |
| Union Mines, Inc | Ruth K group | Uranium | Aug. 21 | 60,800 | 75 |
| *Saguache* | | | | | |
| Gibraltar Minerals Co | Big Indian claims | do | Aug. 16 | 55,580 | 75 |
| *San Juan* | | | | | |
| Jesse A. Bingel | Dora mine | Tungsten-lead-copper. | Aug. 22 | 28,010 | 62 |
| Walby & Clifford | Tin Cup and Gypsy claims. | Tungsten | Feb. 6 | 13,000 | 75 |
| *San Miguel* | | | | | |
| Crown Uranium Co | Lost Brothers mine | Uranium | Aug. 31 | 15,800 | 75 |
| Total | | | | 946,515 | 70 |

[1] Property in Mesa County, Colorado, and Grand County, Utah; value of contract has been split 50–50

before deductions and taxes; such earnings are not wage rates or take-home pay.

In contract construction work, some employees are commonly engaged in mining construction materials. These men are not included in the above totals, as the industry itself does not make the distinction in its employment records.

**Defense Minerals Exploration Administration (DMEA) Program.**—Government participation in the search for strategic minerals continued during 1956. Sixteen DMEA contracts were executed during the year, for a total of $946,515, of which the Government contributed

Digitized by Google

70 percent. As indicated by total contract amounts, exploration carried out under the DMEA program in Colorado has grown significantly in recent years—$511,084 in 1955 and $374,036 in 1954. Contracts executed during 1956 covered exploration for copper, lead, tungsten, uranium, and zinc.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Asphalt and Related Bitumens.**—Construction of a refining plant to produce gasoline and metallurgical coke from gilsonite was begun in April by the American Gilsonite Co. at Fruita, Mesa County. The gilsonite will be supplied from mines at Bonanza, Utah, and transported to the refinery by pipeline. The American Gilsonite Co. is a subsidiary of the Barber Oil Corp. and Standard Oil Co. of California.

**Carbon Dioxide.**—Natural carbon dioxide gas was produced from wells in the McCallum-North field, Jackson County; the Nina View field, Las Animas County; and the McElmo field, Montezuma County. The gas was chilled and compressed to the liquid or solid state. As a liquid the material was used to cool some high-speed machining tools and to extinguish fires. In the more familiar solid form—dry ice—carbon dioxide was used as a refrigerant.

**Coal.**—Colorado coal production for 1956 was 3.5 million tons—2 percent less than the output for the previous year.

Coal delivered to coke ovens within the State amounted to 1.20 million tons, compared with 1.26 million in 1955. Most of this coal was mined in Las Animas County and shipped to Pueblo.

Out-of-State shipments, which represent one-seventh of Colorado's output, rose 6 percent over 1955 in response to increased demand for

**TABLE 4.—Production of coal, 1955–56, by counties**

(Exclusive of mines producing less than 1,000 tons annually)

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Average value per ton [1] | Short tons | Average value per ton [1] |
| Boulder | 24,406 | $6.42 | 5,419 | $6.59 |
| Delta | 52,288 | 5.68 | 58,066 | 5.63 |
| El Paso | 73,384 | 4.73 | 47,172 | 4.77 |
| Fremont | 216,119 | 3.86 | 240,522 | 3.73 |
| Garfield | 33,750 | 5.12 | 24,096 | 6.03 |
| Gunnison | 326,173 | 5.24 | 302,968 | 5.51 |
| Huerfano | 63,903 | 5.82 | 61,892 | 5.83 |
| Jackson | 1,329 | 3.99 | 2,051 | 3.97 |
| La Plata | 54,728 | 3.98 | 51,447 | 4.21 |
| Las Animas | 1,317,403 | 7.11 | 1,232,916 | 7.11 |
| Mesa | 48,363 | 5.18 | 70,360 | 5.36 |
| Moffat | 100,554 | 5.38 | 96,460 | 5.60 |
| Montezuma | 1,108 | 3.98 | | |
| Montrose | 3,220 | 5.44 | 2,707 | 6.54 |
| Pitkin | 91,909 | 7.65 | 153,979 | 7.19 |
| Rio Blanco | 20,046 | 5.86 | 18,630 | 5.53 |
| Routt | 525,039 | 4.40 | 489,938 | 4.37 |
| Weld | 614,208 | 4.36 | 643,540 | 4.50 |
| Total | 3,567,930 | 5.63 | 3,502,163 | 5.66 |

[1] Value received or charged for coal f. o. b. mine, including selling cost. Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.

Digitized by Google

coking coal from Utah coke ovens (Colorado coal delivered to Utah ovens in 1956 amounted to 287,000 tons compared with 224,000 in 1955). Five-sixths of the coal shipped from Colorado was from mines in Pitkin, Gunnison, and Routt Counties, and such shipments were all, one-half, and one-quarter, respectively, of the markets of these counties. Markets outside of Colorado were also important to mines in Moffat and Delta Counties, being two-fifths and one-third of the demand for coal from these two counties.

Coal-fired thermal-electric plants in the State usually consume 400 to 500 thousand tons of coal a year. At year end, two new plants were under construction—at Cameo, Mesa County, and at Nucla, Montrose County. Evidence of the importance of these 2 plants to local coal markets was shown by a contract for the Nucla plant executed in September, in which the Edna Coal Co. agreed to supply the plant with approximately 90,000 tons of coal a year through 1972. The value of the contract, covering 1.4 million tons of coal, was reported to be $6 million.

May 1956 marked the closing of one of Colorado's well-known operations—the Morley mine in Las Animas County, owned and operated by the Colorado Fuel & Iron Corp. The mine was opened in 1906 and had its record production of 491,000 tons in 1928. During its 50-year history the Morley mine yielded 11 million tons of coal, most of which was consumed by the Santa Fe Railway and coking ovens at Pueblo. Coal reserves have been depleted.

Because of limited reserves and a gassy condition that would require extensive changes in the ventilation system to permit mechanical equipment, the Morley mine was never mechanized, and closing of the mine terminated the last large-scale use of mule haulage in the Rocky Mountains. Although animal haulage continued to be employed in some smaller Colorado mines, mules had been displaced by locomotives in all operations as large as the Morley.

**Natural Gas and Natural-Gas Liquids.**—Marketed production of natural gas rose 10 percent over 1955, and output of natural-gas liquids increased almost threefold over the previous year. The large increase in production of LP-gases and natural gasoline resulted from a full year of operation for plants newly installed during 1955 (see Colorado chapter of 1955 Minerals Yearbook, volume III).

Major areas of natural-gas production were in Rio Blanco and Moffat Counties of northwestern Colorado, La Plata County in the southwest, and Logan County and surrounding areas of the Denver-Julesburg basin in the northeast. Plants to produce natural-gas liquids were operated in Logan, Morgan, Rio Blanco, and Moffat Counties.

Twenty new gas-discovery wells were reported during the year; half of them were in western counties, where drilling activity increased markedly. Successful development wells drilled in natural-gas fields totaled 87, compared with 61 in 1955. Over half of the successful development wells were drilled in La Plata County, where activity was focused on the Bondad-Ignacio field.

Drilling for natural gas in the western counties was stimulated by construction of the Pacific Northwest pipeline, completed during 1956.

Digitized by Google

**Petroleum.**—In 1956 Colorado produced 58.5 million barrels of crude petroleum—11 percent more than in the previous year. Main sources of the increase in production were oilfields in Rio Blanco, Washington, Jackson, and Weld Counties. The Weber pool of the Rangely field in Rio Blanco County alone accounted for over half of the increased production, yielding 28.3 million barrels in 1956 compared with 23.9 million in 1955.

Drilling activity in the Denver-Julesburg basin declined markedly during the year, causing an overall drop in drilling totals for the State. In Logan, Morgan, and Washington Counties, the 3 most active counties in both 1955 and 1956, total drilling dropped from 993 holes to 660 holes. Of 26 oil discoveries in the State, all but 1 were in the Denver-Julesburg basin.

The Adena field, largest in the Denver-Julesburg basin and second largest in the State, was placed under unit operation in October, and the Pure Oil Co. was designated as field operator. In addition, Rangely-field operators continued to discuss the problems and differences involved in unit operation of the field. It was estimated that secondary recovery methods, if applied, would increase the ultimate reserves of the 2 fields over 50 percent.

**TABLE 5.—Production of crude petroleum, 1955–56, by counties, in barrels [1]**

| County | 1955 | 1956 | Principal fields in 1956 in order of production |
|---|---|---|---|
| Adams | 1,079,000 | 1,067,000 | Badger Creek, Beacon, Middlemist. |
| Archuleta | 179,000 | 152,000 | Price Gramps, Chromo. |
| Bent | 4,000 | 5,000 | Bent's Fort. |
| Boulder | 2,000 | 3,000 | Boulder, Highland. |
| Elbert | (2) | ---------- | |
| Fremont | 31,000 | 80,000 | Florence-Canon City. |
| Jackson | 278,000 | 725,000 | McCallum-N, Battleship, Canadian River. |
| Jefferson | 8,000 | 3,000 | Soda Lakes. |
| La Plata | 9,000 | 10,000 | Red Mesa, Barker Dome. |
| Larimer | 130,000 | 181,000 | Fort Collins, Wellington, Clark Lake. |
| Logan | 9,021,000 | 7,975,000 | Cliff, Graylin-NW, Yenter. |
| Moffat | 950,000 | 1,281,000 | Powder Wash, Thornburg, Hiawatha. |
| Montezuma | 7,000 | 6,000 | Dove Creek. |
| Morgan | 7,428,000 | 7,376,000 | Adena, Sand River, Orchard. |
| Rio Blanco | 26,174,000 | 30,618,000 | Rangely, Wilson Creek, Douglas Creek-N. |
| Routt | 42,000 | 65,000 | Tow Creek. |
| Washington | 5,784,000 | 7,192,000 | Little Beaver, Plum Bush Creek, Bobcat. |
| Weld | 1,527,000 | 1,827,000 | Black Hollow, Jackpot, Battle Canyon. |
| Total | 52,653,000 | 58,516,000 | |

[1] Distribution by county effected by use of Colorado Oil and Gas Commission data adjusted to Bureau of Mines total.
[2] Less than 500 barrels.

**Shale Oil.**—In July operations ceased at the Federal Bureau of Mines Oil-Shale Experiment Station at Rifle. Maintenance crews only remained active to keep the plant in standby condition. Funds for maintenance were supplied by the Department of the Navy.

During the year Union Oil Co. of California continued to prepare and construct facilities to mine and retort 300 tons a day of oil shale on a pilot-plant basis. The plant site was 12 miles north of Grand Valley in Garfield County. Production of shale oil from test runs was expected early in 1957.

Concurrently, the Denver Research Institute, under a contract with the Oil Shale Corp., began designing a 24-ton-per-day oil-shale pilot plant to be erected in Denver. The design was based on the

Digitized by Google

**TABLE 6.—Wildcat and development completions, in 1956, by counties**

[Oil and Gas Journal]

| County | Oil | Gas | Dry | Total | Footage | County | Oil | Gas | Dry | Total | Footage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Wildcat completions* | | | | | | *Wildcat completions*—Con. | | | | | |
| Adams | 2 | | 36 | 38 | 238,300 | Saguache | | | 1 | 1 | 3,800 |
| Arapahoe | | | 2 | 2 | 11,400 | Washington | 7 | | 165 | 172 | 819,800 |
| Baca | | | 7 | 7 | 38,900 | Weld | 2 | 3 | 51 | 56 | 375,700 |
| Bent | | 1 | 6 | 7 | 35,900 | Yuma | | | 34 | 34 | 131,100 |
| Boulder | | | 6 | 6 | 12,300 | | | | | | |
| Cheyenne | | | 1 | 1 | 4,800 | Total wildcat | 26 | 20 | 629 | 675 | 3,368,100 |
| Crowley | | | 1 | 1 | 7,600 | | | | | | |
| Delta | | 1 | 4 | 5 | 8,200 | *Development completions* | | | | | |
| Dolores | | | 1 | 1 | 8,200 | | | | | | |
| Eagle | | | 1 | 1 | 8,300 | | | | | | |
| Elbert | | | 3 | 3 | 18,900 | Adams | 11 | 1 | 13 | 25 | 136,700 |
| El Paso | | | 5 | 5 | 21,400 | Archuleta | | 1 | | 1 | 5,500 |
| Garfield | | 1 | 1 | 2 | 11,600 | Baca | | 1 | 1 | 2 | 9,500 |
| Huerfano | | | 2 | 2 | 11,200 | Bent | 1 | 1 | | 2 | 11,000 |
| Jackson | | 1 | 5 | 6 | 28,900 | Garfield | | 2 | 1 | 3 | 9,700 |
| Jefferson | | | 1 | 1 | 9,800 | Jackson | 11 | 1 | 5 | 17 | 60,000 |
| Kiowa | | 1 | 1 | 2 | 11,100 | Kiowa | | 1 | | 1 | 5,000 |
| Kit Carson | | | 9 | 9 | 31,100 | Kit Carson | | | 1 | 1 | 5,800 |
| La Plata | | 1 | 16 | 17 | 63,000 | La Plata | | 48 | 9 | 57 | 296,200 |
| Las Animas | | | 3 | 3 | 11,100 | Larimer | 3 | | 4 | 7 | 39,600 |
| Larimer | 1 | | 6 | 7 | 36,000 | Logan | 36 | 8 | 54 | 98 | 513,900 |
| Lincoln | | | 16 | 16 | 72,900 | Mesa | | 1 | | 1 | 3,000 |
| Logan | 6 | 2 | 86 | 94 | 499,900 | Moffat | 12 | 8 | 2 | 22 | 19,400 |
| Mesa | | 3 | 11 | 14 | 44,200 | Montezuma | 2 | 1 | 3 | 6 | 9,200 |
| Moffat | | 2 | 8 | 10 | 45,500 | Morgan | 36 | 3 | 40 | 79 | 453,100 |
| Montezuma | | | 13 | 13 | 40,400 | Rio Blanco | 2 | 5 | 3 | 10 | 39,600 |
| Montrose | | | 5 | 5 | 7,700 | Routt | 3 | | 5 | 8 | 22,000 |
| Morgan | 7 | 1 | 66 | 74 | 433,800 | Washington | 69 | 2 | 72 | 143 | 805,400 |
| Park | | | 6 | 6 | 26,300 | Weld | 39 | 3 | 22 | 64 | 419,000 |
| Phillips | | | 3 | 3 | 12,100 | | | | | | |
| Prowers | | | 3 | 3 | 16,600 | Total development | 225 | 87 | 235 | 547 | 2,863,600 |
| Pueblo | | | 8 | 8 | 24,500 | | | | | | |
| Rio Blanco | 1 | 1 | 14 | 16 | 104,200 | Total all drilling | 251 | 107 | 864 | 1,222 | 6,231,700 |
| Routt | | 1 | 6 | 7 | 18,300 | | | | | | |
| Sedgwick | | 1 | 16 | 17 | 63,300 | | | | | | |

Swedish "Aspeco" process, in which heated ceramic balls are brought into mobile contact with the raw shale to effect heating, thermal decomposition of the contained organic material, and separation of oil and gaseous products.

Sinclair Research Laboratories, Inc., continued experimental work at Haystack Mountain on underground in-place decomposition of oil shale by heat.

## METALS

**Beryllium.**—Output of beryllium concentrate (beryl) in Colorado in 1956 increased fourfold over that in 1955; it was recovered from pegmatite by hand sorting. The beryl was sold to Beryl Ores Co. of Arvada, International Minerals & Chemical Corp., Parkdale, and the Custer (S. Dak.) Government Purchase Depot. In some instances other associated minerals—feldspar, mica, and columbite-tantalite—were recovered as byproducts or coproducts of the beryl. Fremont, Larimer, and Park were the principal beryl-producing counties. Smaller quantities of beryl came from Boulder, Clear Creek, Gunnison, Jefferson, and Lake Counties. The Boomer Lode in Park County, operated by G. H. Sager, was by far the outstanding producer in the State.

**Cadmium, Indium, and Thallium.**—The Globe smelter of the American Smelting and Refining Co. in Denver recovered cadmium,

Digitized by Google

indium, and thallium from flue dust, dross, and other byproduct material shipped to it from other company smelters in 1956.

**Columbium-Tantalum.**—The recorded output of columbium-tantalum concentrate (columbite-tantalite) was small in 1956 compared with 1955. It was recovered by four operators in as many counties as a byproduct of beryl from pegmatite.

**Copper.**—Copper output in Colorado in 1956 declined 2 percent compared with 1955. However, owing to the rise in price of copper, the value of the production increased 11 percent. Ores classed as copper, copper-lead, and copper-lead-zinc yielded 87 percent, and ores classed as lead, lead-zinc, and zinc 11 percent of the copper output. The remaining 2 percent came from ores of gold and silver (mostly smelter fluxing ores) and from fluorspar ore, mill cleanings, and tungsten ore.

The Treasury Tunnel-Black Bear-Smuggler Union group of mines in the Upper San Miguel district of San Miguel County, operated by

**TABLE 7.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1858–1956, in terms of recoverable metals [1]**

| Year | Mines producing | | Material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 243 | 27 | 1,439,276 | 134,518 | $4,708,144 | 2,948,742 | $2,668,735 |
| 1952 | 171 | 20 | 1,548,815 | 124,594 | 4,360,790 | 2,813,643 | 2,546,489 |
| 1953 | 118 | 19 | 1,204,517 | 119,218 | 4,172,630 | 2,200,317 | 1,991,398 |
| 1954 | 123 | 19 | 973,177 | 96,146 | 3,365,110 | 3,417,072 | 3,092,623 |
| 1955 | 120 | 14 | 908,416 | 88,577 | 3,100,195 | 2,772,073 | 2,508,866 |
| 1956 | 124 | 18 | 1,156,019 | 97,668 | 3,418,380 | 2,284,701 | 2,067,770 |
| 1858–1956 | | | [3] | 40,256,738 | 902,862,794 | 758,658,194 | 593,120,944 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 2,641 | $1,141,676 | 25,607 | $8,131,867 | 46,620 | $13,300,108 | $29,950,530 |
| 1952 | 3,606 | 1,745,304 | 30,066 | 9,681,252 | 53,203 | 17,663,396 | 35,997,231 |
| 1953 | 2,941 | 1,688,134 | 21,754 | 5,699,548 | 37,809 | 8,696,070 | 22,247,780 |
| 1954 | 4,523 | 2,668,570 | 17,823 | 4,883,502 | 35,150 | 7,592,400 | 21,602,205 |
| 1955 | 4,323 | 3,224,958 | 15,805 | 4,709,890 | 35,350 | 8,696,100 | 22,240,009 |
| 1956 | 4,228 | 3,593,800 | 19,856 | 6,234,784 | 40,246 | 11,027,404 | 26,342,138 |
| 1858–1956 | 283,536 | 84,914,513 | 2,695,221 | 310,780,175 | 1,774,058 | 323,436,296 | 2,215,114,722 |

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore, old slag, or tailings shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

Digitized by Google

**TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 7,968 | 149,167 | 255 | 1,289 | 3,179 |
| February | 7,417 | 146,460 | 243 | 1,062 | 2,951 |
| March | 8,447 | 181,972 | 307 | 1,720 | 3,493 |
| April | 7,577 | 150,014 | 293 | 1,445 | 2,970 |
| May | 7,829 | 157,104 | 287 | 1,442 | 3,181 |
| June | 7,100 | 152,982 | 296 | 1,569 | 3,564 |
| July | 5,597 | 152,209 | 319 | 1,601 | 3,065 |
| August | 9,577 | 232,827 | 413 | 2,001 | 3,730 |
| September | 9,141 | 208,685 | 422 | 1,900 | 3,236 |
| October | 9,247 | 239,916 | 468 | 2,040 | 3,800 |
| November | 8,963 | 260,664 | 479 | 1,931 | 3,631 |
| December | 8,805 | 252,701 | 446 | 1,856 | 3,446 |
| Total | 97,668 | 2,284,701 | 4,228 | 19,856 | 40,246 |

**TABLE 9.—Gold and silver produced at placer mines, 1947–51 (average) and 1952–56, in fine ounces, in terms of recoverable metals**

| Year | Small-scale hand methods [1] | | Gravel mechanically handled | | | | Total | |
|---|---|---|---|---|---|---|---|---|
| | | | Nonfloating washing plants [2] | | Bucketline and dragline dredges | | | |
| | Gold | Silver | Gold | Silver | Gold | Silver | Gold | Silver |
| 1947–51 (average) | 120 | 28 | 723 | 114 | 14,551 | 2,877 | 15,394 | 3,019 |
| 1952 | 28 | 7 | (3) | (3) | [5] 2,152 | [5] 338 | 2,180 | 345 |
| 1953 | 37 | 11 | 1,046 | 159 | 546 | 75 | 1,629 | 245 |
| 1954 | 79 | 16 | 1,112 | 163 | 364 | 47 | 1,555 | 226 |
| 1955 | 61 | 11 | 1,125 | 181 | 610 | 82 | 1,796 | 274 |
| 1956 | 41 | 6 | 1,227 | 189 | [6] 648 | [6] 88 | 1,916 | 283 |

[1] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
[2] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[3] Production by nonfloating washing plants included with that by bucketline dredges to avoid disclosing individual company confidential data.
[4] Includes 8 fine ounces of gold and 3 fine ounces of silver—byproduct of tungsten ore.

the Idarado Mining Co., was the principal copper producer in the State in 1956. Copper output by this company, recovered from copper, lead, and zinc concentrates produced from the ore, was substantially increased above 1955. This increase virtually balanced a drop in copper production from the Eagle mine operated by The New Jersey Zinc Co., which was the second-ranking copper producer in the State in 1956. The decline in copper output from this mine resulted from a reduction in the quantity of copper ore mined and shipped directly to the smelter and a drop in the copper content of the lead-zinc ore mined and concentrated.

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals**

| County | Mines producing [1] | | Lode material sold or treated (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| Adams | | 4 | | 1,311 | $45,885 | 184 | $167 |
| Boulder | 4 | 2 | 161 | 87 | 3,045 | 5,266 | 4,766 |
| Chaffee | 6 | | 271 | 18 | 630 | 1,972 | 1,785 |
| Clear Creek | 18 | 1 | 21,303 | 5,091 | 178,185 | 76,401 | 69,147 |
| Custer | 3 | | 169 | 4 | 140 | 720 | 652 |
| Dolores | 2 | | 32,970 | 179 | 6,265 | 97,181 | 87,954 |
| Douglas | | 1 | | 3 | 105 | | |
| Eagle | 2 | | 265,682 | 2,053 | 71,855 | 581,901 | 526,680 |
| Fremont | 2 | | 32 | 1 | 35 | 13 | 12 |
| Gilpin | 8 | 3 | 9,266 | 243 | 8,505 | 7,448 | 6,741 |
| Gunnison | 7 | | 73,440 | 94 | 3,290 | 399,355 | 361,436 |
| Hinsdale | 2 | | 37 | 9 | 315 | 1,859 | 1,682 |
| Jackson | 3 | | 7 | | | 94 | 85 |
| Jefferson | | 4 | | 488 | 17,080 | 81 | 73 |
| Lake | 13 | 1 | 48,930 | 3,556 | 124,460 | 156,628 | 141,786 |
| La Plata | 2 | | 38 | 1 | 35 | 2,580 | 2,335 |
| Larimer | 1 | | 3 | | | 2 | 2 |
| Mineral | 2 | | 29,432 | 802 | 28,070 | 111,731 | 101,122 |
| Moffat | 2 | | 479 | 2 | 70 | 198 | 179 |
| Montezuma | 1 | | 15 | 34 | 1,190 | 70 | 63 |
| Ouray | 3 | | 33,981 | 2,647 | 92,645 | 56,475 | 51,113 |
| Park | 5 | 1 | 286 | 70 | 2,450 | 895 | 810 |
| Pitkin | 1 | | 395 | | | 497 | 450 |
| Saguache | 5 | | 401 | 4 | 140 | 2,958 | 2,677 |
| San Juan | 8 | | 19,780 | 841 | 29,435 | 37,283 | 33,743 |
| San Miguel | 3 | | 483,150 | 27,150 | 950,250 | 694,655 | 628,698 |
| Summit | 10 | 1 | 14,032 | 436 | 15,260 | 41,602 | 37,653 |
| Teller | 11 | | 121,759 | 52,544 | 1,839,040 | 6,652 | 6,020 |
| Total: 1956 | 124 | 18 | 1,156,019 | 97,668 | 3,418,380 | 2,284,701 | 2,067,770 |
| 1955 | 120 | 14 | 908,416 | 88,577 | 3,100,195 | 2,772,073 | 2,508,886 |

| County | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Pounds | Value | Pounds | Value | Pounds | Value | |
| Adams | | | | | | | $46,052 |
| Boulder | 8,000 | $3,400 | 85,300 | $13,392 | | | 24,603 |
| Chaffee | 2,800 | 1,190 | 37,300 | 5,856 | 11,600 | $1,589 | 11,050 |
| Clear Creek | 109,000 | 46,325 | 1,151,100 | 180,722 | | | 474,379 |
| Custer | 10,800 | 4,590 | 12,500 | 1,963 | | | 7,345 |
| Dolores | 12,400 | 5,270 | 3,715,900 | 583,396 | 3,336,600 | 457,114 | 1,130,999 |
| Douglas | | | | | | | 105 |
| Eagle | 1,395,100 | 592,917 | 7,258,200 | 1,139,537 | 39,532,100 | 5,415,898 | 7,746,857 |
| Fremont | 700 | 297 | | | | | 344 |
| Gilpin | 3,600 | 1,530 | 173,700 | 27,271 | 47,900 | 6,562 | 50,609 |
| Gunnison | 976,500 | 415,013 | 2,763,800 | 433,917 | 6,395,500 | 876,183 | 2,089,539 |
| Hinsdale | 400 | 170 | 4,000 | 628 | | | 2,795 |
| Jackson | 600 | 255 | | | | | 340 |
| Jefferson | | | | | | | 17,153 |
| Lake | 208,400 | 88,570 | 3,319,000 | 521,083 | 4,255,000 | 582,935 | 1,458,804 |
| La Plata | 1,800 | 765 | | | | | 3,135 |
| Larimer | 100 | 42 | | | | | 44 |
| Mineral | 47,200 | 20,060 | 2,531,100 | 397,383 | 1,853,400 | 253,916 | 800,551 |
| Moffat | 34,800 | 14,790 | | | | | 15,089 |
| Montezuma | 200 | 85 | | | | | 1,338 |
| Ouray | 251,000 | 106,675 | 1,054,700 | 165,588 | 1,175,900 | 161,098 | 577,119 |
| Park | 6,500 | 2,763 | 9,600 | 1,507 | 19,700 | 2,699 | 10,229 |
| Pitkin | | | 71,900 | 11,288 | | | 11,738 |
| Saguache | 8,000 | 3,400 | 111,000 | 17,427 | 14,100 | 1,932 | 25,576 |
| San Juan | 85,600 | 36,380 | 1,665,800 | 261,531 | 1,287,400 | 176,374 | 537,463 |
| San Miguel | 5,262,600 | 2,236,605 | 14,399,000 | 2,260,643 | 20,335,800 | 2,786,005 | 8,862,201 |
| Summit | 29,900 | 12,708 | 1,348,100 | 211,652 | 2,227,000 | 305,099 | 582,371 |
| Teller | | | | | | | 1,845,060 |
| Total: 1956 | 8,456,000 | 3,593,800 | 39,712,000 | 6,234,784 | 80,492,000 | 11,027,404 | 26,342,138 |
| 1955 | 8,646,000 | 3,224,958 | 31,610,000 | 4,709,890 | 70,700,000 | 8,696,100 | 22,240,009 |

[1] Operation at slag dumps and old mill or miscellaneous cleanups not counted as a producing mine.

Digitized by Google

**TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals**

| Source | Number of mines[1] | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Lode ore: | | | | | | | |
| Dry gold | 26 | 124,145 | 52,839 | 7,153 | 1,000 | 2,800 | 2,400 |
| Dry gold-silver | 9 | 5,632 | 363 | 6,910 | 110,700 | 101,900 | ---------- |
| Dry silver | 16 | 8,091 | 94 | 28,349 | 1,900 | 464,000 | ---------- |
| Total | 48 | 137,868 | 53,296 | 42,412 | 113,600 | 568,700 | 2,400 |
| Copper | 11 | 21,788 | 1,415 | 344,315 | 1,152,500 | 157,100 | ---------- |
| Copper-lead | 2 | 11 | 1 | 267 | 1,100 | 4,200 | ---------- |
| Copper-lead-zinc | 3 | 554,821 | 27,151 | 1,089,555 | 6,235,400 | 17,033,200 | 26,622,200 |
| Lead | 40 | 29,768 | 5,260 | 102,507 | 127,600 | 2,345,500 | ---------- |
| Lead-zinc | 30 | 410,963 | 8,489 | 699,955 | 817,600 | 19,487,400 | 53,866,100 |
| Zinc | 1 | 15 | 9 | 20 | 100 | 100 | 1,800 |
| Total | 81 | 1,017,366 | 42,325 | 2,236,619 | 8,334,300 | 39,027,500 | 80,489,600 |
| Other "lode" material: | | | | | | | |
| Cleanings[2] | 2 | 28 | 11 | 87 | ---------- | 4,700 | ---------- |
| Fluorspar ore | 1 | ---------- | 23 | 3,350 | 7,800 | 79,900 | ---------- |
| Mill cleanings[3] | 5 | 14 | 71 | 373 | 100 | 2,500 | ---------- |
| Old slag (lead) | 1 | 748 | 6 | 1,572 | ---------- | 28,700 | ---------- |
| Tungsten ore | 1 | ---------- | 20 | 5 | 200 | ---------- | ---------- |
| Total | 10 | 785 | 131 | 5,387 | 8,100 | 115,800 | ---------- |
| Total "lode" material | 124 | 1,156,019 | 95,752 | 2,284,418 | 8,456,000 | 39,712,000 | 80,492,000 |
| Gravel (placer operations) | 17 | ---------- | 1,916 | 283 | ---------- | ---------- | ---------- |
| Total, all sources | 141 | 1,156,019 | 97,668 | 2,284,701 | 8,456,000 | 39,712,000 | 80,492,000 |

[1] Detail will not necessarily add to totals, because some mines produce more than 1 class of material.
[2] Gold, 4 tons; lead, 19 tons.
[3] Gold, less than 1 ton; gold-silver, 3 tons; lead, 11 tons.

**TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals**

| Type of material processed and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Amalgamation[1] | 6,206 | 2,316 | ---------- | ---------- | ---------- |
| Cyanidation[1] | 52,412 | 6,513 | ---------- | ---------- | ---------- |
| Total recoverable in bullion | 58,618 | 8,829 | ---------- | ---------- | ---------- |
| Concentration, and smelting of concentrates: | | | | | |
| Ore | 35,100 | 1,869,244 | 7,172,200 | 38,272,700 | 80,492,000 |
| Fluorspar ore | 23 | 3,350 | 7,800 | 79,900 | ---------- |
| Tungsten ore | 20 | 5 | 200 | ---------- | ---------- |
| Total | 35,143 | 1,872,599 | 7,180,200 | 38,352,600 | 80,492,000 |
| Direct-smelting: | | | | | |
| Ore | 1,903 | 400,958 | 1,275,700 | 1,323,500 | ---------- |
| Cleanings | 11 | 87 | ---------- | 4,700 | ---------- |
| Mill cleanings | 71 | 373 | 100 | 2,500 | ---------- |
| Old slag | 6 | 1,572 | ---------- | 28,700 | ---------- |
| Total | 1,991 | 402,990 | 1,275,800 | 1,359,400 | ---------- |
| Placer | 1,916 | 283 | ---------- | ---------- | ---------- |
| Grand total | 97,668 | 2,284,701 | 8,456,000 | 39,712,000 | 80,492,000 |

[1] Ore only; no old tailings, etc., processed by this method in 1956.

Digitized by Google

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals**

*A. For ore treated at mills*

| | Ore treated (short tons) | Recoverable in bullion | | Concentrate shipped to smelters [1] and recoverable metals | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Concentrate (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | | | | |
| Boulder | 150 | | | 421 | 44 | 4,383 | 8,000 | 83,600 | |
| Chaffee | 91 | | | 26 | | 61 | | 9,100 | 11,600 |
| Clear Creek | 20,759 | 75 | 22 | 2,022 | 4,931 | 62,285 | 107,900 | 990,900 | |
| Dolores | 32,970 | 96 | 23 | 5,709 | 83 | 97,158 | 12,400 | 3,715,900 | 3,336,600 |
| Eagle | 240,398 | | | 52,169 | 622 | 236,696 | 188,000 | 7,028,100 | 39,532,100 |
| Gilpin | 9,266 | 3 | 1 | 374 | 231 | 7,445 | 3,600 | 173,700 | 47,900 |
| Gunnison | 73,344 | | | 11,604 | 87 | 397,687 | 975,900 | 2,741,800 | 6,395,500 |
| Lake | 42,257 | 1,327 | 861 | 7,565 | 1,906 | 136,093 | 208,400 | 2,805,100 | 4,255,000 |
| Mineral | 28,643 | | | 3,805 | 783 | 104,895 | 47,200 | 2,341,900 | 1,853,400 |
| Ouray | 33,979 | | | 2,782 | 2,647 | 55,903 | 251,000 | 1,054,700 | 1,175,900 |
| Park | 182 | 16 | 2 | 27 | 23 | 282 | 700 | 5,400 | 19,700 |
| Saguache | 100 | 1 | | 36 | 1 | 323 | 300 | 22,800 | 14,100 |
| San Juan | 19,763 | | | 3,081 | 841 | 36,914 | 85,400 | 1,652,600 | 1,287,400 |
| San Miguel | 483,119 | 4,680 | 1,397 | 39,670 | 22,400 | 693,049 | 5,261,500 | 14,397,000 | 20,335,800 |
| Summit | 13,905 | 8 | 10 | 4,587 | 412 | 39,286 | 29,900 | 1,330,000 | 2,227,000 |
| Teller | 121,759 | 52,412 | 6,513 | 23 | 132 | 139 | | | |
| Total: 1956 | 1,120,685 | 58,618 | 8,829 | 133,901 | 35,143 | 1,872,599 | 7,180,200 | 38,352,600 | 80,492,000 |
| 1955 | 830,137 | 55,661 | 10,563 | 112,774 | 22,626 | 1,368,191 | 4,638,200 | 29,994,000 | 70,677,200 |
| **BY CLASSES OF ORE TREATED** | | | | | | | | | |
| Dry gold | 124,120 | 52,534 | 6,545 | 90 | 236 | 399 | 600 | 2,600 | 2,400 |
| Dry gold-silver | 892 | 59 | 17 | 43 | 56 | 1,632 | 200 | 5,200 | |
| Dry silver | 2,450 | | | 44 | 19 | 4,110 | | 16,000 | |
| Copper-lead-zinc | 554,821 | 4,680 | 1,397 | 51,071 | 22,471 | 1,083,158 | 6,235,400 | 17,033,200 | 26,622,200 |
| Fluorspar | | | | 411 | 23 | 3,350 | 7,800 | 79,900 | |
| Lead | 27,424 | | | 2,686 | 5,165 | 75,840 | 118,300 | 1,728,200 | |
| Lead-zinc | 410,963 | 1,341 | 870 | 79,551 | 7,148 | 699,085 | 817,600 | 19,487,400 | 53,866,100 |
| Tungsten | | | | 4 | 20 | 5 | 200 | | |
| Zinc | 15 | 4 | | 1 | 5 | 20 | 100 | 100 | 1,300 |
| Total: 1956 | 1,120,685 | 58,618 | 8,829 | 133,901 | 35,143 | 1,872,599 | 7,180,200 | 38,352,600 | 80,492,000 |
| **BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]** | | | | | | | | | |
| Dry gold | | | | 66 | 179 | 229 | 300 | 100 | |
| Dry gold-silver | | | | 4 | 4 | 51 | | 100 | |
| Dry silver | | | | 11 | 2 | 1,025 | | 900 | |
| Copper | | | | [2] 9,708 | [2] 8,614 | [2] 175,402 | 4,410,600 | 560,700 | 162,700 |
| Copper-lead | | | | 8,850 | 8,285 | 533,969 | 1,304,800 | 6,083,300 | 200 |
| Copper-zinc | | | | 8 | 2 | 57 | 1,200 | 600 | 5,300 |
| Iron [3] | | | | 1,682 | 70 | 2,700 | 4,000 | 23,300 | |
| Lead | | | | [4] 26,175 | [4] 16,725 | [4] 1,043,140 | [4] 850,200 | [4] 31,020,700 | 22,200 |
| Zinc | | | | 87,397 | 1,262 | 111,026 | 609,100 | 662,900 | 80,301,600 |
| Total: 1956 | | | | 133,901 | 35,143 | 1,872,599 | 7,180,200 | 38,352,600 | 80,492,000 |

See footnotes at end of table.

Digitized by Google

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc, in 1956 by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued**

*B. For material shipped directly to smelters*

| | Material shipped (short tons) | Recoverable metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | |
| Boulder | 11 | | 878 | | 1,700 | |
| Chaffee | 180 | 18 | 1,911 | 2,800 | 28,200 | |
| Clear Creek | 544 | 54 | 14,090 | 1,100 | 160,200 | |
| Custer | 169 | 4 | 720 | 10,800 | 12,500 | |
| Eagle | 25,284 | 1,431 | 345,205 | 1,207,100 | 220,100 | |
| Fremont | 32 | 1 | 13 | 700 | | |
| Gunnison | 96 | 7 | 1,668 | 600 | 22,000 | |
| Hinsdale | 37 | 9 | 1,859 | 400 | 4,000 | |
| Jackson | 7 | | 94 | 600 | | |
| Lake | 6,673 | 306 | 19,672 | | 513,900 | |
| La Plata | 38 | 1 | 2,580 | 1,800 | | |
| Larimer | 3 | | 2 | 100 | | |
| Mineral | 789 | 19 | 6,836 | | 189,200 | |
| Moffat | 479 | 2 | 198 | 34,800 | | |
| Montezuma | 15 | 34 | 70 | 200 | | |
| Ouray | 2 | | 572 | | | |
| Park | 104 | 25 | 610 | 5,800 | 4,200 | |
| Pitkin | 395 | | 497 | | 71,900 | |
| Saguache | 301 | 2 | 2,635 | 7,700 | 88,200 | |
| San Juan | 17 | | 369 | 200 | 13,200 | |
| San Miguel | 31 | 70 | 209 | 1,100 | 2,000 | |
| Summit | 127 | 8 | 2,302 | | 18,100 | |
| Total: 1956 | 35,334 | 1,991 | 402,990 | 1,275,800 | 1,359,400 | |
| 1955 | 78,279 | 8,494 | 1,393,045 | 4,007,800 | 1,616,000 | 22,800 |
| **BY CLASSES OF MATERIAL** | | | | | | |
| Dry gold: | | | | | | |
| Crude ore | 25 | 69 | 209 | 400 | 200 | |
| Cleanings | 4 | 5 | 25 | | 200 | |
| Mill cleanings | (5) | 25 | 5 | | | |
| Dry gold-silver: | | | | | | |
| Crude ore | 4,740 | 248 | 5,261 | 110,500 | 96,700 | |
| Mill cleanings | 3 | 2 | 51 | | 200 | |
| Dry silver: Crude ore | 5,641 | 75 | 24,239 | 1,900 | 448,000 | |
| Copper: Crude ore | 21,788 | 1,415 | 344,315 | 1,152,500 | 157,100 | |
| Copper-lead: Crude ore | 11 | 1 | 267 | 1,100 | 4,200 | |
| Lead: | | | | | | |
| Crude ore | 2,344 | 95 | 26,667 | 9,300 | 617,300 | |
| Cleanings | 19 | 6 | 62 | | 4,500 | |
| Mill cleanings | 11 | 44 | 317 | 100 | 2,300 | |
| Old slag | 748 | 6 | 1,572 | | 28,700 | |
| Total 1956 | 35,334 | 1,991 | 402,990 | 1,275,800 | 1,359,400 | |

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] Includes concentrate and contained recoverable metal from tungsten ore.
[3] From copper-lead-zinc and lead-zinc ores.
[4] Includes concentrate and contained recoverable metal from fluorspar ore.
[5] Less than 1 ton.

Digitized by Google

**TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content**

| Class of material | Material shipped or treated (short tons) | Gross metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **CONCENTRATE SHIPPED TO SMELTERS** | | | | | | |
| Dry gold | 66 | 179 | 229 | 389 | 215 | |
| Dry gold-silver | 4 | 4 | 51 | 79 | 175 | |
| Dry silver | 11 | 2 | 1,025 | 7 | 944 | 318 |
| Copper | 9,708 | 8,614 | 175,402 | 4,547,038 | 934,567 | 1,207,379 |
| Copper-lead | 8,850 | 8,285 | 533,969 | 1,536,976 | 6,336,786 | 1,095,860 |
| Copper-zinc | 8 | 2 | 57 | 1,368 | 658 | 5,464 |
| Iron [1] | 1,682 | 70 | 2,700 | 5,506 | 24,777 | 41,475 |
| Lead | 26,175 | 16,725 | 1,048,140 | 1,006,804 | 32,021,543 | 1,261,253 |
| Zinc | 87,397 | 1,855 | 161,138 | 760,102 | 901,266 | 90,596,306 |
| Total: 1956 | 133,901 | 35,736 | 1,922,711 | 7,858,269 | 40,220,931 | 94,208,055 |
| 1955 | 112,774 | 22,997 | 1,394,751 | 5,120,206 | 31,612,211 | 81,497,720 |
| **ORE, ETC., SHIPPED DIRECTLY TO SMELTERS** | | | | | | |
| Dry gold: | | | | | | |
| Crude ore | 25 | 69 | 209 | 503 | 316 | 855 |
| Cleanings | 4 | 5 | 25 | 45 | 282 | |
| Mill cleanings | [2] | 25 | 5 | | | |
| Dry gold-silver: | | | | | | |
| Crude ore | 4,740 | 248 | 5,261 | 112,782 | 146,715 | |
| Mill cleanings | 3 | 2 | 51 | 71 | 264 | |
| Dry silver: Crude ore | 5,641 | 75 | 24,239 | 2,388 | 467,053 | 16,002 |
| Copper: Crude ore | 21,788 | 1,415 | 344,315 | 1,195,252 | 248,701 | |
| Copper-lead: Crude ore | 11 | 1 | 267 | 1,293 | 4,343 | |
| Lead: | | | | | | |
| Crude ore | 2,344 | 95 | 28,667 | 11,326 | 643,023 | 14,503 |
| Cleanings | 19 | 6 | 62 | | 4,734 | |
| Mill cleanings | 11 | 44 | 317 | 220 | 2,512 | |
| Old slag | 748 | 6 | 1,572 | | 29,920 | |
| Total: 1956 | 35,334 | 1,991 | 402,990 | 1,323,880 | 1,547,863 | 31,450 |
| 1955 | 78,279 | 8,494 | 1,393,095 | 4,122,090 | 1,873,064 | 49,097 |

[1] From copper-lead-zinc and lead-zinc ores.
[2] Less than 1 ton.

**Gold.**—Colorado's 1956 gold production increased 10 percent above 1955. Two counties—Teller and San Miguel—contributed most of the State gold output—54 and 28 percent, respectively.

Eleven mines in the Cripple Creek district producing straight gold ore accounted for the Teller County production. All of this ore was treated at the 1,000-ton-per-day Carlton custom mill of the Golden Cycle Corp. This company also operated the Ajax group of mines which was the leading gold producer in Colorado in 1954 and 1955. In 1956, despite an increased output, compared with 1955, these mines ranked second to the Treasury Tunnel-Black Bear-Smuggler Union group of mines operated by Idarado Mining Co. The latter group accounted for most of the gold output from San Miguel County which ranked second to Teller County in 1956.

Other leading gold-producing mines in 1956, in order of output, were Cresson (operated by Cresson Consolidated Gold Mining and Milling Co.) and Vindicator (operated by United Gold Mines Co.), both in the Cripple Creek district of Teller County, and Bald Eagle (operated by Bald Eagle Mining Co.) in the Idaho Springs district of Clear

Digitized by Google

Creek County. The Eagle mine in the Red Cliff (Battle Mountain) district of Eagle County—the 4th largest gold producer in the State in 1955—dropped to 10th place in 1956. This decline resulted from a reduction in the quantity of copper ore mined, from which the gold was recovered as a coproduct, and a lower gold content in the copper ore mined, compared with 1955.

Fifty-five percent of the total gold output was recovered from ores of gold and silver, 43 percent from ores of copper, lead, and zinc, and the remaining 2 percent mostly from placer mining. Fifty-four percent of the gold was recovered by cyanidation of ore, 36 percent by the smelting of concentrate produced from ore, and the remainder by amalgamation, direct smelting of ore and cleanup material, and placer mining.

**Iron Ore.**—During 1956 C. K. Williams Co. shipped bog iron (limonite) from the Iron Springs placer mine at Ophir, San Miguel County, to buyers outside of the State for use in the manufacture of paint. Output dropped by one-third, compared with 1955, because of a lower demand for this material. Iron ore for the Colorado Fuel & Iron Corp. plant at Pueblo was obtained from company mines in Utah and Wyoming.

**Lead.**—Colorado lead output rose from 15,805 tons in 1955 to 19,856 tons in 1956, a 26-percent increase. Most of this advance resulted from the stimulus incident to the rise in the price of lead from the yearly average weighted price of 14.9 cents in 1955 to 15.7 cents in 1956. The bulk (63 percent) of the State lead output was recovered as a byproduct or coproduct of complex ores of copper, lead, and zinc from 3 mines. Of these, the leading lead producer was by far the Treasury Tunnel-Black Bear-Smuggler Union group of mines, operated by Idarado Mining Co. It was followed by The New Jersey Zinc Co. Eagle mine and the Rico Argentine Mining Co. Rico-Argentine mine. Other leading lead-producing mines were Keystone Unit, Resurrection, and Emperius.

**Molybdenum.**—The Climax Molybdenum Co. mine on Fremont Pass 13 miles north of Leadville in Lake County again produced the entire output of molybdenum from Colorado in 1956. In its annual report to the stockholders, the company reported that production in 1956 fell below the production in 1954 and 1955, despite a record tonnage of ore (9,930,000 tons) mined and milled. The decline in molybdenum output resulted from the necessity of mining and drawing lower grade ore. The quantity of ore mined during 1956 represented the greatest annual production in the history of the mine and the greatest ever achieved from an underground mine in North America.

**Rare-Earth Metals.**—There was considerable activity in rare-earth mining in Colorado during 1956. Production and sales of gadolinite, samarskite, and yttrium-bearing fluorite were reported in Jefferson and Park Counties. The largest producer was Edwin Over and associates at the Boomer mine in Park County, where gadolinite and yttrium-bearing fluorite were recovered. Beal & Associates was the second-ranking shipper and produced yttrium-bearing fluorite from a property in Jefferson County. Yttrium-bearing fluorite was also reported in Jefferson County by M. F. Kurtz and other producers, whereas a small quantity of samarskite was produced by Elements, Inc., also in Jefferson County.

Digitized by Google

**TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals**

| County and district | Mines producing [1] | | Lode material sold or treated (short tons) | Gold (fine ounces) | | | Silver (fine ounces) | | | Copper (pounds) | Lead (pounds) | Zinc (pounds) | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Lode | Placer | Total | Lode | Placer | Total | | | | |
| Adams County | | 4 | | | 1,311 | 1,311 | | 184 | 184 | | | | $46,052 |
| Boulder County: | | | | | | | | | | | | | |
| Central (Jamestown) | 1 | | | 23 | | 23 | 3,350 | | 3,350 | 7,800 | 79,900 | | 19,696 |
| Gold Hill | | 1 | | | 35 | 35 | | 2 | 2 | | | | 1,227 |
| Grand Island | 1 | 1 | 5 | | 8 | 8 | 828 | 3 | 831 | | 1,000 | | 1,189 |
| Ward | 2 | | 156 | 21 | | 21 | 1,083 | | 1,083 | 200 | 4,400 | | 2,491 |
| Chaffee County: | | | | | | | | | | | | | |
| Chalk Creek | 2 | | 53 | 3 | | 3 | 133 | | 133 | | 4,900 | 2,800 | 1,379 |
| Monarch | 4 | | 218 | 15 | | 15 | 1,839 | | 1,839 | 2,800 | 32,400 | 8,800 | 9,671 |
| Clear Creek County: | | | | | | | | | | | | | |
| Argentine and Griffith [2] | 4 | | 8,303 | 248 | | 248 | 15,659 | | 15,659 | 15,600 | 165,000 | | 55,387 |
| Cascade and Ute Creek | 1 | | 100 | 13 | | 13 | 4 | | 4 | | | | 459 |
| Empire | 1 | | 202 | 13 | | 13 | 212 | | 212 | 500 | 11,700 | | 2,697 |
| Idaho Springs | 6 | 1 | 9,152 | 4,568 | 31 | 4,599 | 40,627 | 4 | 40,631 | 88,000 | 629,800 | | 334,016 |
| Montana | 4 | | 2,992 | 126 | | 126 | 17,727 | | 17,727 | 2,800 | 232,100 | | 58,084 |
| Trail Creek or Freeland (Lamartine) | 2 | | 554 | 92 | | 92 | 2,168 | | 2,168 | 2,100 | 112,500 | | 23,736 |
| Custer County: Hardscrabble | 3 | | 169 | 4 | | 4 | 720 | | 720 | 10,800 | 12,500 | | 7,345 |
| Dolores County: Pioneer | 2 | | 32,970 | 179 | | 179 | 97,181 | | 97,181 | 12,400 | 3,715,900 | 3,336,600 | 1,139,999 |
| Douglas County: | | | | | | | | | | | | | |
| Newlin Gulch | | 1 | | | 3 | 3 | | | | | | | 105 |
| Eagle County: | | | | | | | | | | | | | |
| Burns-McCoy and Red Cliff (Battle Mountain) [3] | 2 | | 265,682 | 2,053 | | 2,053 | 581,901 | | 581,901 | 1,395,100 | 7,258,200 | 39,532,100 | 7,746,857 |
| Fremont County: Cotopaxi | 2 | | 32 | 1 | | 1 | 13 | | 13 | 700 | | | 344 |
| Gilpin County: | | | | | | | | | | | | | |
| Northern | 1 | 1 | 40 | 11 | 2 | 13 | 8 | | 8 | | | | 462 |
| Southern | 7 | 2 | 9,226 | 223 | 7 | 230 | 7,438 | 2 | 7,440 | 3,600 | 173,700 | 47,900 | 50,147 |
| Gunnison County: | | | | | | | | | | | | | |
| Elk Mountain and Tomichi [3] | 6 | | 73,402 | 93 | | 93 | 398,177 | | 398,177 | 975,900 | 2,748,300 | 6,395,500 | 2,086,049 |
| Rock Creek | 1 | | 38 | 1 | | 1 | 1,178 | | 1,178 | 600 | 15,500 | | 3,790 |
| Hinsdale County: | | | | | | | | | | | | | |
| Galena | 1 | | 6 | 1 | | 1 | 69 | | 69 | 300 | 3,300 | | 742 |
| Lake | 1 | | 31 | 8 | | 8 | 1,790 | | 1,790 | 100 | 700 | | 2,053 |
| Jackson County: Pearl | 3 | | 7 | | | | 94 | | 94 | 600 | | | 340 |
| Jefferson County | | 4 | | | 488 | 488 | | 81 | 81 | | | | 17,153 |
| Lake County: | | | | | | | | | | | | | |
| California | 12 | 1 | 48,929 | 3,537 | 17 | 3,554 | 156,620 | 2 | 156,622 | 208,400 | 3,319,000 | 4,255,000 | 1,458,729 |
| Granite | 1 | | 1 | 2 | | 2 | 6 | | 6 | | | | 75 |
| La Plata County: California | 2 | | 38 | 1 | | 1 | 2,580 | | 2,580 | 1,800 | | | 3,135 |
| Larimer County: Manhattan | 1 | | 3 | | | | 2 | | 2 | 100 | | | 44 |
| Mineral County: Creede | 2 | | 29,432 | 802 | | 802 | 111,731 | | 111,731 | 47,200 | 2,531,100 | 1,853,400 | 800,551 |
| Moffat County: Douglas Mountain (Sunbeam) | 2 | | 479 | 2 | | 2 | 198 | | 198 | 34,800 | | | 15,039 |

Digitized by Google

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Montezuma County: | | | | | | | | | | | | | |
| California | 1 | | 15 | 34 | | 34 | 70 | | 70 | 200 | | | 1,338 |
| Ouray County: | | | | | | | | | | | | | |
| Red Mountain | 1 | | 2 | | | | 572 | | 572 | | | | 518 |
| Sneffels | 2 | | 33,979 | 2,647 | | 2,647 | 55,903 | | 55,903 | 251,000 | 1,054,700 | 1,175,900 | 576,601 |
| Park County: | | | | | | | | | | | | | |
| Alma Placers-Fairplay | | 1 | | | 6 | 6 | | 1 | 1 | | | | 211 |
| Buckskin | 2 | | 172 | 30 | | 30 | 462 | | 462 | 1,400 | 6,200 | 18,400 | 5,557 |
| Consolidated Montgomery | 1 | | 20 | 32 | | 32 | 63 | | 63 | 300 | 100 | 1,300 | 1,499 |
| Freshwater | 1 | | 65 | | | | 101 | | 101 | 4,800 | 400 | | 2,194 |
| Mosquito Creek | 1 | | 29 | 2 | | 2 | 268 | | 268 | | 2,900 | | 768 |
| Pitkin County: Roaring Fork | 1 | | 395 | | | | 497 | | 497 | | 71,900 | | 11,738 |
| Saguache County: Kerber Creek (Bonanza) | 5 | | 401 | 4 | | 4 | 2,958 | | 2,958 | 8,000 | 111,000 | 14,100 | 25,576 |
| San Juan County: | | | | | | | | | | | | | |
| Animas | 4 | | 15,978 | 757 | | 757 | 28,945 | | 28,945 | 66,200 | 1,489,700 | 1,127,700 | 469,205 |
| Eureka | 4 | | 3,802 | 84 | | 84 | 8,338 | | 8,338 | 19,400 | 176,100 | 159,700 | 68,258 |
| San Miguel County: | | | | | | | | | | | | | |
| Iron Springs | | | 9 | 12 | | 12 | 119 | | 119 | 100 | 1,300 | | 775 |
| Lower and Upper San Miguel [2] | 3 | | 483,141 | 27,138 | | 27,138 | 694,536 | | 694,536 | 5,262,500 | 14,397,700 | 20,335,800 | 8,861,426 |
| Summit County: | | | | | | | | | | | | | |
| Breckenridge | 2 | 1 | 8,501 | 358 | 8 | 366 | 20,913 | 4 | 20,917 | 27,500 | 1,151,200 | 1,659,800 | 451,559 |
| Montezuma | 6 | | 5,012 | 9 | | 9 | 19,259 | | 19,259 | 2,100 | 181,200 | 537,800 | 120,765 |
| Ten Mile Consolidated | 2 | | 518 | 61 | | 61 | 1,257 | | 1,257 | 300 | 15,400 | 29,400 | 9,847 |
| Wilkinson | | | 1 | | | | 169 | | 169 | | 300 | | 200 |
| Teller County: Cripple Creek | 11 | | 121,759 | 52,544 | | 52,544 | 6,652 | | 6,652 | | | | 1,845,060 |
| Total Colorado | 124 | 18 | 1,156,019 | 95,752 | 1,916 | 97,668 | 2,284,418 | 283 | 2,284,701 | 8,456,000 | 39,712,000 | 80,492,000 | 26,342,138 |

[1] Operations at slag dumps and old mill or miscellaneous cleanups not counted as a producing mine.
[2] Combined to avoid disclosing individual company confidential data.

468877—58——19

Digitized by Google

All mine production was sold to Beryl Ores Co. of Arvada and to Rare Earth Chemical Co. of Mead.

**Silver.**—Ninety-eight percent of the total silver output in Colorado in 1956 was recovered as a byproduct of ores of copper, lead, and zinc. Three mines—Treasury Tunnel-Black Bear-Smuggler Union group, Eagle, and Keystone Unit—supplied 73 percent of the State silver production. The 18-percent decline in silver output in 1956 (compared with 1955) resulted mainly from a reduction in the quantity of copper ore mined from the Eagle mine (from which silver is recovered as a byproduct) and a lower silver content of the copper ore mined.

**Tin.**—The Climax Molybdenum Co. recovered 24.37 short tons of tin concentrate containing 39.6 percent or 8.62 long tons of metallic tin as a byproduct from the treatment of molybdenum ore. This concentrate was not sold by the close of the year; therefore, it was not recorded as mineral production in Colorado in 1956 but will be shown in the year when it is marketed.

**Tungsten.**—Production of tungsten concentrate (60-percent $WO_3$ equivalent) in Colorado in 1956 decreased 24 percent compared with 1955. Most of this decline resulted from a drop in the output of tungsten concentrate from the Climax Molybdenum Co. mine in Lake County—the major tungsten producer in the State—where tungsten was recovered as a byproduct of the treatment of molybdenum ore. According to the company, tungsten output declined in 1956 compared with 1955, despite the fact that a higher tonnage of ore was fed to the tungsten plant, because of a lower tungsten content in the ore, which varies considerably in molybdenum, tungsten, and tin content from place to place in the mine.

Part of the decline in tungsten output in the State in 1956 resulted from an overall drop in production from the 63 individual mines in Boulder County and 1 in Gilpin County. This drop was due to the uncertainty of the extension of the Government domestic purchase program for tungsten during the interim between May 1956, when the purchase quota was filled, until July, when Public Law 733 was enacted extending the program. Lowering of the price from $63 per unit to $55 on the new program reduced the incentive to produce, and exhaustion of Government Purchase Program funds for tungsten concentrate early in December closed most of the operations.

In Boulder County, Cold Spring Tungsten, Inc., second-ranking producer of tungsten in the State, continued to operate the Hetzer mill on custom ore and on ore from its mine. The Tungsten Refining, Inc., and Wah Chang Corp. custom mills were active throughout the

**TABLE 16.—Shipments of tungsten concentrate (60-percent $WO_3$), 1947–51 (average), 1952–56, and total, 1900–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 206 | $437,156 | 1955 | 1,152 | $4,079,341 |
| 1952 | 625 | 2,354,664 | 1956 | 873 | 3,010,074 |
| 1953 | 817 | 2,902,490 | | | |
| 1954 | 927 | 3,420,663 | 1900–56 | 29,982 | [1] 41,068,378 |

[1] Value estimated for some years.

Digitized by Google

year on ore produced by individual small tungsten-ore producers in Boulder County.

Two DMEA contracts for tungsten-exploration projects and one for a tungsten-lead-copper project, totaling $57,110 and financed jointly by Government and private capital, were awarded in the State in 1956.

**Uranium.**—Production of uranium ore from Colorado mines from July 1, 1955, to June 30, 1956, amounted to 394,000 tons at an average grade of 0.30 percent contained $U_3O_8$. State tonnage for the period represented 18 percent of the domestic total. Production data are based on information supplied to the Federal Bureau of Mines by the AEC.

Ore reserve for the State, as of November 1, totaled 4.1 million tons at an average grade of 0.33 percent contained $U_3O_8$[2] and represented 6.8 percent of the domestic uranium-ore reserve. The reserve given included measured, indicated, and inferred ore; the last class composed approximately two-fifths of the State total.

A major portion of the ore reserve was concentrated in Mesa, Montrose, and San Miguel Counties, which also supplied 95 percent of the production in the July–June fiscal year. These 3 counties, plus Dolores and Montezuma, contained approximately 70 percent of the total reserve. Other counties containing significant reserves were Moffat, Rio Blanco, Saguache, Grand, Jefferson, Fremont, and Boulder.

**TABLE 17.—Mine production of uranium ore during the fiscal year 1956[1]**

| County | July–December, 1955 | | | January–June, 1956 | | |
|---|---|---|---|---|---|---|
| | Number of properties | Ore (short tons) | $U_3O_8$ contained (pounds) | Number of properties | Ore (short tons) | $U_3O_8$ contained (pounds) |
| Boulder | 3 | 189 | 1,477 | 3 | (2) | (2) |
| Clear Creek | 1 | (2) | (2) | 1 | (2) | (2) |
| Custer | 1 | (2) | (2) | | | |
| Dolores | | | | 1 | (2) | (2) |
| El Paso | 1 | (2) | (2) | | | |
| Fremont | 3 | (2) | (2) | 2 | (2) | (2) |
| Garfield | 4 | (2) | (2) | 2 | (2) | (2) |
| Gilpin | 2 | (2) | (2) | | | |
| Huerfano | 2 | (2) | (2) | 1 | (2) | (2) |
| Jefferson | 8 | 1,004 | 7,321 | 8 | 4,900 | 41,713 |
| La Plata | | | | 1 | (2) | (2) |
| Lartmer | 1 | (2) | (2) | 2 | (2) | (2) |
| Mesa | 51 | 36,441 | 252,519 | 75 | 38,242 | 251,311 |
| Moffat | 5 | (2) | (2) | 9 | (2) | (2) |
| Montezuma | 1 | (2) | (2) | 1 | (2) | (2) |
| Montrose | 116 | 94,497 | 576,847 | 138 | 121,534 | 710,607 |
| Pueblo | 1 | (2) | (2) | | | |
| Rio Blanco | 11 | 494 | 3,777 | 8 | (2) | (2) |
| Saguache | 5 | (2) | (2) | 1 | (2) | (2) |
| San Juan | 1 | (2) | (2) | 1 | (2) | (2) |
| San Miguel | 69 | 34,840 | 205,440 | 81 | 43,483 | 241,496 |
| Undistributed | | 6,520 | 25,095 | | 11,602 | 57,180 |
| Total | 286 | 173,985 | 1,072,476 | 335 | 219,761 | 1,302,307 |

[1] Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[3] AEC, Statistics on Domestic Uranium Production and Reserves: Press Release 178 (Grand Junction, Colo., office). Dec. 13, 1956, 3 pp.

Digitized by Google

The capacity of uranium-milling operations was also released in December [3] and was given as follows:

| Location, county: | Rated capacity, tons per day | Operator |
|---|---|---|
| Durango, La Plata | 430 | Vanadium Corp. of America. |
| Grand Junction, Mesa | 350 | Climax Uranium Corp. |
| Naturita, Montrose | 350 | Vanadium Corp. of America. |
| Rifle, Garfield | 280 | Union Carbide Nuclear Co. |
| Uravan, Montrose | 850 | Do. |
| Total | 2,260 | |

The milling capacity for Colorado represented one-quarter of the national total.

During the year contracts for four additional mills in Colorado were negotiated with the AEC. They were:

| Location, county: | Rated capacity, tons per day | Operator |
|---|---|---|
| Bedrock, Montrose | 200 | Atomic Fuels Extraction Co. |
| Gunnison, Gunnison | 200 | Gunnison Mining Co. |
| Maybell, Moffat | 300 | Trace Elements Corp. |
| Rifle, Garfield | 1,000 | Union Carbide Nuclear Co. |
| Total | 1,700 | |

By the year end construction work had begun on the new mill at Rifle, to replace the smaller operating plant at the same location; it was designed to operate in conjunction with upgrading plants at other locations to give in effect a daily capacity of 1,000 tons of raw ore.

Private exploration and development drilling for uranium within the State increased slightly to 1.1 million feet. A more pronounced change was shown in the footage driven in underground workings (shafts, adits, drifts, raises, etc.), which totaled 84,000 feet compared with 68,000 in 1955.

Ten DMEA contracts were executed for uranium exploration in Colorado for a total amount of $700,140. Growth of DMEA activities in uranium exploration is indicated by comparison with previous years: In 1955, 14 contracts totaling $308,154; in 1954, 6 contracts totaling $232,773.

**Vanadium.**—Mine production of vanadium, in terms of recoverable metal, for Colorado was 5.6 million pounds compared with 4.6 million in the previous year. Vanadium was mined in conjunction with uranium from mines in Montrose, Mesa, and San Miguel Counties and was processed at mills in Colorado. All five operating mills in the State recovered vanadium. These mills also processed ore from other States (primarily Utah and Arizona), which represented approximately one-third of the vanadium-bearing ore supplied to the plants.

**Zinc.**—Zinc output in Colorado in 1956 increased 14 percent in quantity and 27 percent in value of production, compared with 1955. Part of this increased output resulted from the stimulus of an advance in price; the annual weighted average price for zinc was 13.7 cents a pound in 1956, compared with 12.3 cents in 1955. Substantially increased output of zinc was reported for 2 of the 3 leading zinc producers in the State—Treasury Tunnel-Black Bear-Smuggler

[3] Work cited in footnote 2.

Digitized by Google

Union and Keystone Unit. Output from the leading producer in the State (Eagle mine) dropped in 1956 because of a lower zinc content in the ore mined. Together these 3 mines yielded 82 percent of the total State zinc output. Other major zinc-producing mines were Resurrection, Rico-Argentine, Emperius, Wellington, and Camp Bird, in that order.

## NONMETALS

**Cement.**—In terms of value, cement was the fourth ranking commodity produced by the mineral industries of Colorado in 1956. Shipments of portland and masonry cements, the highest in the history of the State, were 1 percent above 1955. Value, on the other hand, was 5 percent higher due to a rise in the average price. The three cement plants at Portland (wet and dry process) and Boettcher (dry process) operated at optimum capacity throughout 1956, producing types I, II, III, oil-well, waterproof, and masonry cements, the bulk of which was shipped by truck. To supply its need for raw materials, the Ideal Cement Co. (operator of all plants) mined limestone, clays, gypsum, sandstone, and sand. Other raw materials were purchased locally or brought in from other States. The cement plants consumed 93.4 million kilowatt-hours of electrical energy in 1956 and 9 kilns were in operation during the year. Shipments were reported into California, Kansas, Nebraska, New Mexico, Oklahoma, Utah, and Wyoming, as well as local purchases in Colorado.

**Clays.**—Coupled with the demand for brick and other structural-clay products by the construction industry of the State, output of clays rose to 523,000 tons valued at $1.2 million in 1956, a 13-percent increase in tonnage and a 9-percent rise in value. Mining in 1956 was conducted at 40 underground and open-pit mines, compared with 41 in 1955. During 1956 all types of clay except bentonite gained in mine output, but the largest percentage increase was in the fire-clay group. Clays were mined in 10 counties, and the larger producing counties were Jefferson, Boulder, Douglas, and Pueblo. Fire-clay production reached 304,000 tons in 1956 compared with 262,000 tons in 1955, and production of miscellaneous clay rose from 202,000 tons in 1955 to 218,000 in 1956. No bentonite was produced in 1956 owing to cessation of mining in Bent County by Clay Productions, Inc. The use of fire clay in manufacturing building brick and other structural-clay commodities represented the bulk of the total produced, followed by the consumption of fire clay in manufacturing firebrick and block, fire-clay mortar, clay crucibles, art pottery, floor and wall tile, terra cotta, and refractories for foundries and steelworks. Building brick and heavy clay products consumed all but a small quantity of total miscellaneous-clay output; the exception was the miscellaneous clay used for art pottery.

Mining in 1956 was carried on by 27 companies or individuals that either sold their entire output or used it in manufacturing clay products. Of the 523,000 tons of clays produced in Colorado in 1956, 201,000 tons was sold by producers and 322,000 tons used. The leading mine operators of fire-clay deposits were: Golden Brick Co., George W. Parfet Estate, Inc., and H. M. Rubey Clay Co., in Jefferson County; Pueblo Clay Products Co., in Pueblo County; and S. A.

Digitized by Google

TABLE 18.—Production of clays, 1955–56, by counties

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Bent | 207 | $931 | | |
| Boulder | 101,624 | 177,842 | 97,751 | $171,065 |
| Delta | 831 | 1,454 | 801 | 1,402 |
| Douglas | 58,794 | 159,362 | 77,243 | 206,563 |
| El Paso | 17,891 | 63,982 | 11,892 | 44,178 |
| Fremont | 18,807 | 61,060 | 6,282 | 21,358 |
| Huerfano | 7,969 | 41,837 | 9,501 | 49,880 |
| Jefferson | 168,419 | 382,077 | 236,605 | 501,091 |
| Las Animas | 7,082 | 15,984 | 7,543 | 16,972 |
| Mesa | 4,500 | 7,875 | 1,764 | 2,664 |
| Pueblo | 78,107 | 205,547 | 73,191 | 200,132 |
| Total | 464,231 | 1,117,901 | 522,573 | 1,215,305 |

Whisenhunt, in Douglas County. The major producers of miscellaneous clay in the State were Colorado Brick Co., in Boulder County; Robinson Brick & Tile Co. and Lakewood Brick & Tile Co., in Jefferson County; and Summit Pressed Brick & Tile Co., in Pueblo County.

The average value for fire clay, f. o. b. mine, in 1956 reported to the Federal Bureau of Mines was $2.69 per ton and $1.82 per ton for miscellaneous clay.

The market and manufacturing center for brick and other clay products was concentrated largely in the Denver metropolitan area. One of the larger brick manufacturers in this region was the Robinson Brick & Tile Co., which, according to its 1956 annual report, sold over $3 million worth of clay products. During its 76th year of continuous operation the company completed installing automatic equipment valued at $1 million, which will reduce raw clay to minute particles, mix clays to formula, and finally deliver the clay in the form of tiles ready for drying and burning. The rated capacity of the new installation was 36 tons per hour.

Robinson also reported the addition of 1 open-pit and 1 underground mine during the year, making a total of 14 mines supplying clays for the plant, as well as the expansion of its sales dealerships to include 22 Western States, Alaska, Hawaii, and western Canada.

**Feldspar.**—The demand for ground feldspar used in glass and pottery manufacture remained strong in 1956, and output of crude potash and soda feldspar rose to 47,000 tons, a 2-percent increase over 1955. Prices for crude material reported by mine operators rose from $6.80 per short ton in 1955 to $6.96 per short ton in 1956, indicating an upward price trend to stimulate larger mine production.

Chaffee County continued to be the largest producing region, and the M & S mine of M & S, Inc., was the only active mining operation reported in the county. Jefferson County ranked second in terms of output, with 17 mines, followed by Fremont, with 13 operators. In all, there were 42 individuals or companies for which mine production was reported, and approximately 30 individual deposits worked during the year. All mines were worked by open-pit methods. The crude feldspar was trucked to a grinding plant at Salida and another at Denver.

**Fluorspar.**—Output of Acid-grade fluorspar concentrate in Colorado continued to decline in 1956 and dropped 5 percent below 1955. This

Digitized by Google

decrease was due to the availability to consumers of large quantities of imported fluorspar at a price which, according to western operators, was below that needed for profitable operation of their mines. Ozark-Mahoning Co. and General Chemical Division, Allied Chemical & Dye Corp., were the only producers of any consequence. Two tons of Metallurgical-grade fluorspar was reported in Boulder County and 30 tons in Park County. This output resulted from a limited demand created by operation of industrial furnaces in the Denver area. Of the finished fluorspar, 44 percent was used in manufacturing hydrofluoric acid, 55 percent went to the Government stockpile, and 1 percent was consumed in cement manufacturing and metallurgical uses.

TABLE 19.—Shipments of fluorspar, 1947–51 (average), 1952–56, and total 1905–56

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 24,265 | $803,961 | 1954 | 59,197 | $3,197,252 |
| 1952 | 29,185 | 1,505,968 | 1955–56 | (1) | (1) |
| 1953 | 53,276 | 2,872,360 | | | |
| | | | 1905–56 | 839,725 | 24,563,857 |

[1] Figure withheld to avoid disclosing individual company confidential data.

Mine production was reported by Ozark-Mahoning Co. at its Emmett and Afterthought mines in Boulder County and the Northgate mines in Jackson County. General Chemical Division only operated its Burlington mine in Boulder County. Crude ore was treated at the Valmont mill of General Chemical and the Jamestown and Northgate mills of Ozark-Mahoning Co.

**Gem Stones.**—The value of gem stones collected in Colorado during 1956 reached $30,000 and included agate, onyx, beryl, garnet, amazonite, topaz, quartz, alabaster, satin spar, amethyst, moss opal, jasper, pyromorphite, rhodonite, and turquois. Production was reported in 18 of the 63 counties in the State, with the largest value of material collected reported in Saguache County. Turquois from the Villa Grove turquois lode was the most important stone, followed by agate and amethyst. Mineral County ranked second in terms of value, followed by Fremont, Chaffee, and Teller.

**Gypsum.**—Production of gypsum in 1956 reached 88,000 tons—the highest in Colorado history—and resulted principally from the demand for crude ore by the gypsum-wallboard plant of Pabco Building Materials Division, Fibreboard Paper Products Corp., at Florence. The strong demand for gypsum in manufacturing cement and gypsum products continued in 1956, and mine output was again concentrated in Fremont and Larimer Counties. Mine production was reported by Ideal Cement Co. in Fremont County, and Ernest W. Munroe supplied gypsum to the Ideal cement plant in Larimer County. Production of crude gypsum also was reported by United States Gypsum Co. in Larimer County, U. S. Soil Conditioning Co. in Fremont County, and Atlas Mining & Manufacturing Co. in Delta County.

On June 7, 1956, the $2.5 million plant of Pabco Building Materials Division was dedicated, and production of wallboard, sheathing, and lath began a few days later. The plant is on a 47-acre site 4 miles

Digitized by Google

east of Florence. A feature of the plant is the 10-deck drier, which hardens the finished wallboard.

**Mica.**—Mine output of scrap mica continued the downward trend reported in 1954 and 1955 by dropping to 517 tons in 1956, a 26-percent decline over 1955 and 58 percent less than in 1954. The decrease was not due to lessened demand for good-quality ground mica but rather to the relatively low price and competition of substitute materials, which precluded a higher price for mine production. Fremont County remained the largest producing area, with output reported by eight mine operators. Park, Larimer, and Jefferson, in that order, were the next most important producing counties.

For the first time in a number of years sales of sheet mica were reported in Colorado. J. R. Rose, operating the Big Moose mine in Clear Creek County, and L. E. Coosh, working the Lil Kat Lode in Larimer, shipped hand-cobbed mica to the Custer, S. Dak., depot of the General Services Administration.

**Perlite.**—The steady demand for expanded perlite for use as aggregate, replacing sand, in gypsum plaster, for grouting oil wells, loose-fill insulation, and as a filler resulted in a 4-percent increase in mine production. The Rosita mine of the Great Lakes Carbon Corp. continued to be the only source of crude perlite, and the bulk of the mine shipments were to company expanding plants in other States. Persolite Products, Inc., was the only plant operated in Colorado, and the expanded material produced was used in plaster and concrete aggregate.

**Pumice.**—Production of volcanic scoria in Colorado during 1956 continued to decline by dropping to 50,000 tons, a 29-percent decline over 1955. The Mesita Hill mine of Colorado Aggregate Co., Inc., Costilla County, and the McCoy mine of McCoy Aggregate Co., Routt County, continued to be the only active mining operations in the State. Of the 50,000 tons produced during the year, 44,000 tons was used in concrete aggregate and 6,000 tons as railroad ballast.

**Pyrites.**—Record production of sulfuric acid during 1956 was reported; in addition, the output of pyrite used to make acid also reached a new high. The largest producer was the Rico Argentine Mining Co. at Rico, Dolores County. During the year a flotation plant to upgrade tailings was constructed. This plant, working on the lower grade portions of the tailings, produced a pyrite concentrate ranging from 45 to 50 percent sulfur. According to reports, the acid plant was producing 200 tons of pure sulfuric acid per day. Preparations were also made to mine the pyrite underground, and several million tons was reported blocked out. The only other shipper of pyrite concentrate was the Climax Molybdenum Co. in Lake County. Output resulted from treatment of pyrite-bearing concentrate at the company byproduct plant at Climax; the material was shipped to the Denver plant of Allied Chemical & Dye Corp., where it was processed to produce sulfuric acid.

**Salt.**—The Union Carbide Nuclear Co. in Montrose County continued to be the only producer of salt in Colorado in 1956. Production came from a brine well operated by the company and was used in processing uranium ores.

Digitized by Google

**Sand and Gravel.**—The demand for sand and gravel for highway construction and building needs reached a new high in 1956 by rising to 15.1 million tons—an increase of 17 percent over 1955 and 12 percent above the previous record of 1954. Of the 1956 production total, 9.8 million tons was classified as Government-and-contractor production and 5.3 million tons as commercial output. This compares with 8.2 million tons and 4.7 million tons in 1955.

Government-and-contractor production was reported in 54 counties and commercial output in 17 counties; sand and gravel was tabulated for 55 out of the 63 counties in the State. Adams County, with a recorded production of 2.4 million tons, was the leading producer, followed by Arapahoe, Jefferson, Pueblo, El Paso, Lincoln, Weld, and Boulder Counties, all of which produced 500,000 tons or more.

Two-thirds of the total material sold or used in 1956 was produced by private contractors and used on Federal, State, and county highway and municipal projects. Of the 9.8 million tons of Government-and-contractor production, 80 percent was washed, screened, or otherwise prepared, and of the 5.3 million tons of commercial material, 95 percent was processed. Pit-run or prepared material was transported predominantly by truck, as only 1 percent of the total production was shipped by railroad. The leading commercial producers included Cooley Gravel Co., Western Paving Construction Co., Broderick & Gibbons, Rio Grande Co., Fountain Sand & Gravel Co., Brannan Sand & Gravel Co., Hall Sand & Gravel, Inc., and Colorado Materials Co. These 8 operators supplied 65 percent of the commercial output and 23 percent of the total State production. The major contractors engaged in Government roadwork, and who produced 50 percent of the total Government-and-contractor production and 33 percent of the State output, were Pioneer Construction Co., Northwestern Engineering Co., Peter Kiewit Sons' Co., Schmidt Construction, Inc., C. L. Hubner Co., Blanchard Construction Co., and Herren & Strong.

**Stone.**—Production of all types of stone quarried in Colorado during 1956 rose to 2.25 million tons—a 5-percent advance over 1955. Increased production was reported for crushed limestone, which represented 91 percent of the total. Gains in output were also reported for dimension sandstone, granite, and crushed marble. Decreases were noted in the quarrying of dimension marble and crushed sandstone and miscellaneous stone.

The bulk of the total stone tonnage in 1956 was used in manufacturing cement. The next largest use was as a flux, followed by use as concrete aggregate, as a refractory, as riprap, and in sugar refining. Sandstone was the principal dimension stone produced; flagging and rough and dressed building stone were the more important uses. The leading producers of limestone were Ideal Cement Co., Fremont and Larimer Counties; Colorado Fuel & Iron Corp., Chaffee and Fremont Counties; and Frank H. Norberg Co., Fremont, Garfield, and Larimer Counties.

**Vermiculite.**—Exfoliated vermiculite was produced at Denver by the Western Mineral Products Co. from ore produced in Montana. The finished product was used as loose-fill insulation, lightweight plaster, and concrete aggregate.

Digitized by Google

## REVIEW BY COUNTIES

**Adams.**—Petroleum was produced from 15 fields, 3 of which—Badger Creek, Beacon, and Middlemist—composed seven-eighths of the total county production. The Second Creek field (sec. 8, T. 3 S., R. 6 SW.) was discovered during the year, and a confirmation well was reported being drilled at year end. Drilling activity was considerably less than in 1955, as was true of the whole Denver-Julesburg basin.

Output of sand and gravel in 1956 increased 12 percent over 1955, and the county continued to rank as the largest producer in the State. Productive operations were reported by 9 operators—6 classified as commercial and 3 as Government-and-contractor producers. Western Paving Construction Co. led in production, followed by Cooley Gravel Co. and Brannan Sand & Gravel Co. These firms supplied 82 percent of the 1,382,000 tons of commercial output. Highway contracts let by the State highway department and activities of highway-department crews resulted in the production of 976,000 tons of paving gravel. Of the 2,358,000 tons of sand and gravel produced in Adams County, all was washed, crushed, or otherwise prepared.

**TABLE 20.—Value of mineral production in Colorado, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adams | $5,179,207 | $4,865,652 | Petroleum, sand and gravel, gold, silver. |
| Alamosa | 56,526 | 89,000 | Sand and gravel. |
| Arapahoe | 714,582 | 1,468,750 | Do. |
| Archuleta | 550,442 | 422,500 | Petroleum. |
| Baca | 33,166 | 27,000 | Sand and gravel. |
| Bent | 28,574 | 101,700 | Sand and gravel, petroleum. |
| Boulder | 3,193,451 | 4,350,411 | Stone, fluorspar, tungsten, sand and gravel, clays, coal, lead, petroleum, silver, copper, gold, feldspar, beryl, mica. |
| Chaffee | 988,339 | 977,425 | Stone, feldspar, sand and gravel, lead, silver, zinc, copper, gem stones, gold. |
| Cheyenne | ---------- | 67,000 | Sand and gravel. |
| Clear Creek | 109,980 | 481,836 | Lead, gold, silver, copper, stone, sand and gravel, feldspar, gem stones, mica, beryl. |
| Conejos | 21,474 | 121,000 | Sand and gravel. |
| Costilla | 87,005 | 85,791 | Pumice, sand and gravel. |
| Crowley | 849 | ---------- | |
| Custer | 727,863 | 778,043 | Perlite, copper, stone, lead, sand and gravel, silver, gold, gem stones. |
| Delta | 592,364 | 617,211 | Coal, sand and gravel, clays, gypsum. |
| Denver | 111,611 | 382,500 | Sand and gravel. |
| Dolores | [1] 1,507,772 | 1,580,607 | Lead, zinc, pyrite, silver, gold, copper. |
| Douglas | 243,489 | 384,078 | Clays, sand and gravel, stone, feldspar, gem stones, gold. |
| Eagle | 9,651,425 | 7,752,034 | Zinc, lead, copper, silver, gold, stone. |
| Elbert | 24,744 | 85,020 | Sand and gravel, gem stones. |
| El Paso | 1,073,474 | 1,172,090 | Sand and gravel, coal, stone, clays, mica. |
| Fremont | 11,524,720 | 12,712,561 | Cement, stone, coal, gypsum, petroleum, feldspar, clays, sand and gravel, beryl, mica, gem stones, copper, gold, silver. |
| Garfield | 297,477 | 173,522 | Coal, stone. |
| Gilpin | 81,453 | 52,378 | Lead, gold, silver, zinc, sand and gravel, copper, tungsten. |
| Grand | 94,063 | 82,000 | Sand and gravel. |
| Gunnison | 2,512,057 | 3,818,583 | Coal, zinc, lead, copper, silver, stone, feldspar, sand and gravel, gold, beryl, columbium-tantalum. |
| Hinsdale | 14,720 | 16,795 | Sand and gravel, silver, lead, gold, copper. |
| Huerfano | 413,535 | 573,821 | Coal, sand and gravel, clays. |
| Jackson | 2,642,267 | 3,688,470 | Petroleum, fluorspar, sand and gravel, coal, copper, silver. |
| Jefferson | 1,131,279 | 1,613,655 | Sand and gravel, clays, feldspar, gold, rare earth minerals, petroleum, mica, beryl, gem stones, silver, columbium-tantalum. |
| Kiowa | 59,252 | 17,000 | Sand and gravel. |
| Kit Carson | 11,830 | 72,000 | Do. |

See footnotes at end of table.

Digitized by Google

TABLE 20.—Value of mineral production in Colorado, 1955–56, by counties—Con.

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Lake | $52,323,801 | $54,122,510 | Molybdenum, tungsten, zinc, lead, silver, gold, copper, pyrite, stone, beryl. |
| La Plata | 534,080 | 347,117 | Coal, stone, sand and gravel, petroleum, silver, copper, gold. |
| Larimer | 5,468,570 | 5,582,042 | Cement, stone, petroleum, sand and gravel, gypsum, beryl, feldspar, mica, copper, columbium-tantalum, silver. |
| Las Animas | 9,415,036 | 8,940,827 | Coal, stone, sand and gravel, clays, gem stones. |
| Lincoln | 68,087 | 368,000 | Sand and gravel. |
| Logan | 24,926,473 | 22,378,500 | Petroleum, sand and gravel. |
| Mesa | 669,793 | 650,140 | Coal, sand and gravel, clays, stone, gem stones. |
| Mineral | 722,940 | 805,501 | Lead, zinc, silver, gold, copper, gem stones, sand and gravel. |
| Moffat | 3,241,996 | 4,148,915 | Petroleum, coal, sand and gravel, copper, silver, gold. |
| Montezuma | 245,231 | 44,363 | Petroleum, stone, sand and gravel, gold, copper, silver. |
| Montrose | 115,106 | 84,780 | Sand and gravel, salt, coal, gem stones. |
| Morgan | 20,361,957 | 20,651,300 | Petroleum, sand and gravel. |
| Otero | 38,248 | ---- | |
| Ouray | 658,218 | 577,119 | Lead, zinc, copper, gold, silver. |
| Park | 97,081 | 99,402 | Beryl, rare-earth minerals, feldspar, copper, zinc, gold, lead, mica, fluorspar, silver, gem stones, columbium-tantalum. |
| Phillips | ---- | 8,000 | Sand and gravel. |
| Pitkin | 703,517 | 1,141,846 | Coal, sand and gravel, lead, silver. |
| Prowers | 55,255 | 87,000 | Sand and gravel. |
| Pueblo | 949,396 | 1,004,732 | Sand and gravel, clays, stone. |
| Rio Blanco | 72,135,825 | 85,224,537 | Petroleum, coal, sand and gravel. |
| Rio Grande | 994 | 235,150 | Sand and gravel, gem stones. |
| Routt | [3] 2,721,929 | 2,461,122 | Coal, petroleum, sand and gravel, pumice and pumicite. |
| Saguache | 91,580 | 72,576 | Sand and gravel, gem stones, lead, copper, silver, zinc, gold. |
| San Juan | 281,751 | 597,763 | Lead, zinc, sand and gravel, copper, silver, gold, gem stones. |
| San Miguel | 5,425,082 | 8,889,026 | Zinc, lead, copper, gold, silver, sand and gravel, iron ore, gem stones. |
| Sedgwick | 1,636 | 29,060 | Sand and gravel, gem stones. |
| Summit | 328,911 | [3] 583,871 | Zinc, lead, silver, gold, copper, sand and gravel. |
| Teller | 1,667,599 | 1,904,372 | Gold, sand and gravel, stone, silver, feldspar, gem stones, mica. |
| Washington | 16,032,243 | 20,197,000 | Petroleum, sand and gravel. |
| Weld | 7,279,865 | 8,321,641 | Petroleum, coal, sand and gravel. |
| Yuma | 162,212 | 164,500 | Sand and gravel. |
| Undistributed | 17,105,632 | [3] 32,870,006 | |
| Total [4] | [1] [5] 286,219,000 | 329,450,000 | |

[1] Revised figure.
[2] Excludes value of manganese ore sold and blended at Government low-grade stockpiles for future beneficiation.
[3] Includes value of carbon dioxide, gem stones, natural gas, natural-gas liquids, uranium, vanadium, sand and gravel, and stone production that cannot be assigned to specific counties.
[4] Total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.
[5] Excludes uranium; uranium figure for 1955 not released by Atomic Energy Commission.

Opening of the new Inland Sand & Gravel Co. plant at Adams City north of Denver was a highlight of the industry in 1956. This processing facility—the newest in the area—is a modern, flexible operation capable of producing a wide range of sizes and adjustable to wide variations in graduation of the deposit. The plant was designed to handle an input of 300 tons per hour and by the end of 1956 was averaging 200 tons per hour of finished products, the difference being largely an excess of 8- and 16-mesh waste material. Five salable products were being made: Sand; ⅜-inch chips; and ¼- to ⅝-inch, ¼- to ¾-inch, and ⅜- to 1¼-inch gravel. Also notable was the first large hydraulic dredge in this area. The river-bed deposit is at the junction of Clear Creek and the Platte River 5 miles north of Denver, and the plant was the only one operating on the Platte River north of

Digitized by Google

Denver—most of them are farther west on Clear Creek. The deposit averages 30 feet in depth and is well graded, with about 45 percent under ¼ inch in size and very little over 2 inches. The overburden is light and consists largely of sand.

All gold and silver output in Adams County in 1956, virtually equal to 1955, was recovered as a byproduct at some of the sand and gravel washing and screening plants. Kerkling & Slensker recovered gold and silver from sluice boxes at the stationary plants of Brannan Sand & Gravel Co. gravel pits 8 and 10 and F. S. Rizzuto gravel pit. The Cooley Gravel Co. recovered gold and silver in sluice boxes on the floating washing plant (fed by dragline) at the North Plant pit.

**Alamosa.**—Sand and gravel production in Alamosa County during 1956 rose to 343,000 tons compared with 180,000 in 1955, owing largely to increased highway-construction activities. Contracts let to Graham Construction Co., Pioneer Construction Co., and Siegrist Construction Co. through the State highway department provided the stimulus for this output.

One refinery was operated at Alamosa by the Oriental Refining Co. Crude oil supplied to the refinery was derived from the Chromo and Price-Gramps fields in Archuleta County and the Florence-Canon City field in Fremont County.

**Arapahoe.**—As a result of increased highway construction in Arapahoe County during 1956, output of sand and gravel rose to 1.4 million tons valued at $1.5 million—a gain of 87 percent in tonnage and a twofold increase in value. Total production comprised 958,500 tons of commercial structural sand and gravel plus a small quantity of filter sand and 471,000 tons of Government-and-contractor paving gravel. The major commercial operators were Cooley Gravel Co., Hall Sand & Gravel, Inc., and Herbertson Sand & Gravel Co. Peter Kiewit Sons' Co. and C. L. Hubner were the contractors for the State and county highway departments. Construction and maintenance crews of the Colorado Department of Highways and the county highway department produced 124,000 tons of paving gravel.

**Baca.**—Natural gas was produced from the Greenwood field. One development well was completed by Cities Service Co. in the South Greenwood field, although no production was reported for the field. Some sand and gravel was also produced.

**Bent.**—C. L. Hubner Co., Schmidt Construction, Inc., and Leon K. Suhm, as contractors for the Colorado Department of Highways, produced 211,000 tons of paving gravel valued at $88,000. Because of the shutdown of the mine of Clay Productions, Inc., no bentonite was reported in Bent County during 1956.

Petroleum was produced from the Bent's Fort field. During 1956 2 successful development wells were completed in the field; 1 was an oil producer by Stansbury Oil Co., and the second was a gas well by El Paso Natural Gas Co. Additionally, a gas discovery was reported by D. D. Harrington. The new field was named Lubers field and produced 10 million cubic feet of gas per day on initial testing.

**Boulder.**—Boulder County was a source of 14 mineral commodities in 1956; of these, stone, fluorspar, and tungsten led in terms of value.

Sales of nonmetals composed 76 percent of the total value of mineral output in Boulder County during 1956 compared with 59 percent in 1955. This gain was due principally to an increase in the value of

Digitized by Google

stone. For the first time in the history of the county, the value of stone outranked fluorspar—long the leading mineral commodity. Production of all types of stone rose from 21,000 tons valued at $320,000 in 1955 to 94,000 tons valued at $1,693,000 in 1956. This increase resulted largely from the accelerated building program under way at the University of Colorado at Boulder. The university, operating its Ingersoll and Hall quarries, produced 73,000 tons of rough construction dimension sandstone valued at $1.5 million. Boulder County continued to be the leading source of commercial dimension sandstone in Colorado. The major producers were Dewey H. Summers, The Jacobson-Lyons Stone Co., Inc., and Loukonen Bros.

The Emmett and Afterthought mines of Ozark-Mahoning Co. were the largest producers of crude fluorspar in Colorado during 1956, followed closely by the Burlington mine of Allied Chemical & Dye Corp. Both companies continued to operate mills—Ozark at Jamestown and Allied at Boulder—but output fell slightly below 1955. Underground operations at the Burlington mine utilized 28 miners, who worked an average of 238 days whereas 7 men worked a like period in surface operations. The mill at Boulder employed 14 men for 273 days. Employment at the Emmett mine reached 11 men (9 underground and 2 surface), and the workyear averaged 318 days. On the other hand, 4 men were engaged in mining at the Afterthought mine for 278 days. The Wano mill at Jamestown operated 330 days and employed 13 men.

Sand and gravel production reached 505,000 tons in 1956—a slight increase over 1955. The bulk of the output was classified as commercial and was reported by Boulder Gravel Products, Inc., and Golden Transfer Co. The Colorado Department of Highways (through the activities of W. Hodgman & Sons, Inc., and Lowdermilk Bros.) produced 181,000 tons of paving gravel.

The Colorado Brick Co. continued to operate its Rocky Flats and Valmont open-pit miscellaneous-clay mines during 1956. The company also operates a brick plant at Valmont.

Mining operations by the SMN Mining Co. at the Little Bonnie pegmatite resulted in the production of 76 long tons of feldspar and 4 short tons of scrap mica.

The value of the tungsten produced was 23 percent of the total for minerals produced in the county in 1956, compared with 34 percent in 1955. Sixty-three individual operations and possibly more produced tungsten ore. Three tungsten mills for upgrading the ore to a marketable product were operated in the county. Cold Spring Tungsten, Inc., treated custom ore at the Hetzer mill, in addition to ore from its mine. The Tungsten Refining, Inc., and Wah Chang Corp. mills operated exclusively on custom ore from Boulder County.

The total value of metals other than tungsten produced in the county in 1956, including lead, silver, copper, gold, and beryl (in order of value of output), was only one-third of that in 1955. Eighty percent of this value in 1956 was derived from lead, silver, copper, and gold recovered from lead concentrate produced as a byproduct of the treatment of fluorspar ore at the Jamestown operation (Afterthought, Argo, Blue Jay, Brown Spar, Emmett, and Escanaba mines) of the Ozark-Mahoning Co. Small quantities of gold, silver,

Digitized by Google

and copper were also recovered as byproducts of tungsten ore mined by Gold & Tungsten Consolidated from the Golden Queen mine. Limited amounts of gold, silver, and lead were recovered from the Comstock mine by Durable Construction Co. and from White Raven mine by Don P. Sandidage. Boulder Gravel Products, Inc., recovered a little gold and silver by placer-mining methods incidental to washing and preparing sand and gravel from the George Sawhill Ranch pit and by E. J. & R. M. Ford as a byproduct of tungsten concentrate recovered from the Cougar Gulch placer. Beryl was produced and sold to Beryl Ores Co. of Arvada from the Little Bonnie mine by Specht, Morris & Novick.

During the first half of the year, shipments of uranium ore were made from the Central M D, Lulu B Lode, and Mountain Goat mines operated by the Golden Age Uranium Co., Jimtown Uranium Co., and Frontier Mining Corp., respectively. In addition, Mountain States Uranium, Inc., carried out tunnel work on the Mamie and Buffalo No. 1 claims.

Petroleum was produced in the Boulder and Highland fields.

In May the county's only operating coal mine—the Black Diamond No. 2—was closed by the Black Diamond Fuel Co. During its 25-year history the mine produced 802,000 tons.

**Chaffee.**—The value of nonmetals continued to be all but a small portion of the total for mineral production in Chaffee County in 1956. Increased values for feldspar and sand and gravel were offset by decreases for stone and gem stones; accordingly, the total for the county declined slightly. Sand and gravel valued at $67,500 was reported by the State and county highway departments, and M & S, Inc., produced all the feldspar reported.

Of the 384,000 tons of stone reported in 1956, all but a small quantity was crushed limestone mined at the Monarch Quarry of Colorado Fuel & Iron Corp. A strike in July at the Pueblo Steel Plant and conversion of the company railroad from narrow to standard gage stopped quarrying operations for 3 months. The Colorado Granite Co. produced 100 tons of dressed monumental stone for local consumption. Agate, onyx, beryl, and garnet valued at $975 were recovered from various outcrops and surface diggings throughout the county.

The Reynolds Mining Corp. Poncha Springs fluorspar mine and mill remained idle during 1956, with only necessary maintenance by company personnel. The property was on a standby basis to permit resumption of operations at any time. The Brown Canyon fluorspar properties of General Chemical Division, Allied Chemical & Dye Corp., also were idle in 1956, with only a small amount of development carried on. The U. S. Fluorspar Co. properties managed by Peter L. Bancroft of Denver were under development, and the company retained a Salida mining firm to complete re-evaluation preliminary to resumption of mining operations.

Six mines that produced the gold, silver, copper, lead, and zinc reported for the county in 1956 supplied 1 percent of the total value of mineral production. Each of these mines produced less than 100 tons of ore during the year. No beryl or tungsten was produced.

**Clear Creek.**—Mining activity increased in the county throughout 1956. The total value of gold, silver, copper, and lead, which ad-

Digitized by Google

vanced from $80,000 in 1955 to $474,000 in 1956, made up 98 percent of the total value of mineral production in the county during the year. Eighteen lode mines and one placer mine produced these metals. In addition, exploration, development, or rehabilitation work was conducted at 30 other nonproducing mines in Clear Creek County.

The Grizzly Gulch, Bald Eagle, Red Elephant group, Crazy Girl, and Senator mines were the principal gold, silver, copper, and lead producers in the county. The Grizzly Gulch mine was operated by the Greater Minerals Corp. from the beginning of the year until August 20, when the British Western American Uranium Corp. took over the mine. Most of the ore was treated in the company 100-ton-per-day flotation mill at Georgetown. All mine buildings and equipment destroyed by fire in the fall of the year were rebuilt and new machinery and ore bins installed by the close of the year. The Bald Eagle mine, operated by the Bald Eagle Mining Co.—a joint venture between Jackpot Oil Co. of Denver and Hafen Leavitt of Idaho Springs— was working out of Two Brothers Tunnel in Virginia Canyon. The mine was completely mechanized and electrified during the year. The ore mined was milled at the Front Range mill at Idaho Springs and the concentrate (in addition to some crude ore) was shipped to the Arkansas Valley plant of the American Smelting and Refining Co. at Leadville.

Universal Oil & Uranium Corp. made several shipments of lead ore from the Red Elephant mine during 1956. Charles E. Fetterhoff and Robert M. Shatto shipped 199 tons of lead ore containing 6 fine ounces of gold, 8,439 ounces of silver, and 73,491 pounds of lead, and 3 tons of lead concentrate containing 72 fine ounces of silver and 847 pounds of lead to the Arkansas Valley plant from the Senator mine. The Crazy Girl Mining Co. (Howard Coffindaffer) operated the Crazy Girl mine throughout the year.

Lone Star Mining & Development Corp. shipped uranium ore from the Lone Star No. 1 claim during the first half of the year. Universal Oil & Uranium Corp. did some drifting on the Red Elephant group of claims.

The preparation of sand and gravel and stone for highway construction and the mining of pegmatites produced nonmetal commodities valued at $7,400 in 1956. Construction and maintenance crews of the Colorado Department of Highways were responsible for all sand and gravel produced; and the Federal Bureau of Public Roads quarried some dimension granite, which was used as rubble in a reclamation project. Joe Grover continued to operate the Grover Dike, producing potash feldspar. Feldspar production was also reported by Carl Ballast from the Paradise Mountain mine, and hand-cobbed mica was shipped to the Custer (S. Dak.) GSA Depot by J. R. Rose. Gem stones collected in the county during 1956 consisted of amazonite picked up by Ben Nott in the Buffalo Creek area.

**Costilla.**—Volcanic scoria continued to provide the major portion of the value of mineral production in Costilla County in 1956. However, output fell from 36,000 tons in 1955 to 18,000 in 1956. The Colorado Aggregate Co., Inc., continued to be the only producer, operating its open-pit mine for 292 days and employing 2 men. The crushing plant was operative for 292 days, and 3 men were employed. Graham Construction Co., as contractor for the Colorado Department

Digitized by Google

of Highways, and construction crews of the State highway department produced 79,000 tons of paving gravel.

**Custer.**—The value of perlite, stone, sand and gravel, and gem stones produced was 99 percent of the total for mineral output in Custer County in 1956. Crude perlite produced by the Great Lakes Carbon Corp. at its Rosita mine was the most important mineral, followed by construction materials—stone and sand and gravel—quarried by contractors for the State highway department and the Federal Bureau of Public Roads. Two hundred pounds of agatized wood was collected in the Westcliffe area.

The Defender mine—the major producer of lead and the only producer of zinc in Custer County in 1955—was inactive in 1956. The gold, silver, copper, and lead output came from Big Annie (C. P. Parsons), Navajo (J. K. Banks), and Passiflora (Passiflora Mining Co.) mines, all in the Hardscrabble district of Custer County.

**Delta.**—Coal was produced from 7 operations employing 50 men. Approximately one-third of the county coal production was sold outside of Colorado.

Sand and gravel output in 1956 totaled 376,000 tons, the bulk of which was produced by the Delta County Highway Department. The Delta Sand & Gravel Co. reported the production of structural and paving sand and paving gravel. Miscellaneous clay continued to be mined by the Delta Brick & Tile Co. for use at its brick plant, and 300 tons of agricultural gypsum was produced at the Doty mine by the Atlas Mining & Manufacturing Co. of Delta.

Minerals Engineering was reported to have made a natural-gas discovery in the Happy Hollow area.

**Denver.**—Denver County continued to be the principal marketing area for most of the mines in adjacent counties—particularly for nonmetals. Denver was the focal point for the manufacture of brick and other structural-clay products in the State, and plants were operated by Denver Fire Clay Co., Denver Brick & Pipe Co., Denver Terra Cotta Co., Overland Pressed Brick Co., Robinson Brick & Tile Co., and Western Tile Manufacturing Co. In addition to brick and other similar commodities produced by these manufacturing facilities, the Denver Fire Clay Co. and Denver Brick & Pipe Co. manufactured refractory-grade products. All companies either mined their own raw clay or purchased it from local mine operators. Certain special clays were purchased from out-of-State sources.

A number of processing plants for other nonmetallic minerals also were active during the year and continued to play an important part in the industrial growth of Colorado. Consolidated Feldspar Department, International Minerals & Chemical Corp., operated its Denver feldspar-grinding plant on crude material from mines in adjacent counties and from Wyoming and South Dakota. Western Mineral Products Co. produced exfoliated vermiculite at its Denver plant from crude vermiculite from Montana, and General Chemical Division, Allied Chemical & Dye Corp., operated its sulfuric-acid plant on pyrite concentrate obtained from Lake County.

Late in 1956 the Denver Research Institute began constructing its "Aspeco" oil-shale pilot plant. Another addition to the development of Colorado resources was the Kerr-McGee Oil Industries, Inc., metallurgical and research laboratory; the laboratory will direct work

Digitized by Google

on uranium-processing research. Also, the Globe byproducts smelter of American Smelting and Refining Co. recovered cadmium, indium, and thallium from flue dust, dross, and other material shipped to it from various company smelters.

**Dolores.**—The Rico-Argentine mine operated by the Rico Argentine Mining Co. was again the principal producer of gold, silver, copper, lead, and zinc in Dolores County in 1956 and ranked third, fifth, and sixth in output of lead, zinc, and silver, respectively, in the State. Lead-zinc ore mined was treated in the company mill at Rico; the products (lead and zinc concentrates) were shipped to the United States Smelting Refining and Mining Co. lead smelter at Midvale, Utah, and to The Anaconda Co. zinc smelter at Black Eagle, Mont.

J. Ben Williford carried out underground exploration and development on the Rainy Day and Pack Rat claims during the year. One shipment of uranium ore was made from the Rainy Day claim.

Production of pyrite used in manufacturing sulfuric acid continued to be the most important nonmetal activity of the mineral industry of Dolores County during 1956. Rico Argentine Mining Co. was the only company reporting output of pyrite. The company sulfuric-acid plant at Rico operated throughout the year as well as the tailings upgrading plant below the Rico-Argentine mill.

**Douglas.**—The total value of mineral output in Douglas County rose to $384,000 in 1956 compared with $243,000 in 1955. This increase was due to a rise in the value of sand and gravel and clays sold during the year. Of the 77,000 tons of clays sold or used in 1956, 70,000 tons was fire clay mined by T. L. Helmer (Helmer mine), S. A. Whisenhunt (Stevens mine), and Robinson Brick & Tile Co. (Hogback mine). The remaining 7,000 tons was miscellaneous clay quarried by Robinson Brick & Tile Co. at its Diamond and Ute mines. Sand and gravel output in 1956 rose to 312,000 tons compared with 130,000 tons in 1955. Commercial production amounted to 19,000 tons of structural sand and gravel, and the remainder was paving gravel produced by construction crews of the State and county highway departments and Bushman Construction Co. and Northwestern Engineering Co. as contractors for the Colorado Department of Highways.

Crushed limestone was the only stone quarried during the year, and shipments by John T. Fox and Helmer Bros. were used as a flux. Development at the Three Musketeers mine by Martin & Nolan and the Lone Pine mine by Carl Quinn resulted in shipment of 109 tons of mixed and 101 tons of potash feldspar to the Denver plant of International Minerals & Chemical Corp.

The value of gem or ornamental stones collected during 1956 was $270 and consisted of topaz and smoky quartz picked up by the Colorado Mineral Society and Ben Nott around Devil's Head.

**Eagle.**—A decline in the value of output of gold, silver, and copper was responsible for most of the drop in the total value of mineral production in Eagle County from $9.7 million in 1955 to $7.8 million in 1956. The combined value of lead and zinc output increased 6 percent in 1956, compared with 1955. No production of sand and gravel was reported. A small quantity of stone was quarried and sold in the county.

465877—58——19

Digitized by Google

The Eagle mine, operated continuously throughout the year by The New Jersey Zinc Co., was the leading producer of zinc in the State and was second to the Treasury Tunnel-Black Bear-Smuggler Union group of mines in San Miguel County in output of silver, copper, and lead. The value of its output of lead and zinc increased, but the value of output of gold, silver, and copper fell considerably below 1955. The decline resulted from a reduction in the quantity of copper ore carrying gold, silver, and lead mined and shipped directly to the smelter by the company. One other reason for the decline was that this ore had a lower metal content than in prior years. The lead-zinc ore from the mine was milled at the company 1,200-ton-per-day underground mill, and the lead and zinc concentrates produced were shipped to smelters.

The Copper King mine was operated by McFarland & Hullinger from August 1 to the end of the year. The direct-smelting gold-silver ore containing lead and copper was shipped to the American Smelting and Refining Co. smelter at Garfield, Utah.

**El Paso.**—The continued decline in the value of coal production in El Paso County during 1956 increased the relative contribution of the nonmetals to the total value of all mineral output.

Decreased sales were noted not only for coal but also clays and stone. However, a 92-percent gain in the quantity of sand and gravel sold or used more than offset these declines, and the total value of mineral production for the county rose to $1.2 million in 1956—a 9-percent gain.

Of the 994,000 tons of sand and gravel produced in 1956, 521,000 tons was Government-and-contractor production. As in past years, contractors for the State highway department produced and prepared the bulk of this material. During 1956 Bushman Construction Co. and Domenic Leone Construction Co. were the contractors. Production was also reported by the county highway department and the city of Colorado Springs. Construction of the Air Force Academy north of Colorado Springs further stimulated productive activity. Jack Adams & Haake Construction Co., Inc., and Nowers Construction Co. were the contractors for the Air Force Academy Construction Agency.

Crushed granite, limestone, and miscellaneous stone, used largely as concrete aggregate, were quarried during 1956. The Castle Concrete Co. quarried decomposed granite and crushed limestone. Limestone also was mined by the Certified Sand & Gravel Co. and Colorado Materials Co. (Lennox-Breed quarry). Construction activities at the Air Force Academy resulted in the production of 18,000 tons of crushed miscellaneous stone by Jack Adams & Haake Construction Co., Inc., Colorado Constructors, Inc., Mountain States Construction Co., Nowers Construction Co., and T. F. Scholes. Clay production in 1956 came from the National Clay Products Co., Robinson Brick & Tile Co. (Apache No. 7 mine), and Standard Fire Brick Co. (Husted mine). Alvin Sexton shipped a small quantity of scrap mica to the Pueblo grinding plant of International Minerals & Chemical Corp.

Two coal mines operated during the year—the Pikeview mine of the Pikes Peak Fuel Division of the Golden Cycle Corp. and the Franceville strip mine of the Franceville Coal Co.

Digitized by Google

**Fremont.**—Fremont County was a source of 14 mineral commodities during 1956 including 8 nonmetals, 2 fuels, and 4 metals. Of the 14, cement, stone, and coal were most important in terms of value.

The production and shipments of types I, II, and III, waterproof, and masonry cements from the Portland plant of Ideal Cement Co. continued to dominate the mineral industry of Fremont County. Shipments were 5 percent greater than in 1955; 18 men were employed at the quarry and 165 at the crusher and cement plant. Two 400-foot and five 120- to 125-foot rotary kilns were operated during the year, and the finished product was shipped to Kansas, Nebraska, New Mexico, Oklahoma, Utah, and Wyoming, in addition to local markets.

The total value of stone produced in 1956 rose to $1,619,000, a 24-percent increase over 1955. Crushed limestone continued to be the most important type of stone; production reached 1,053,000 tons, valued at $1,554,000, 80,400 tons and $474,000 greater than in 1955. Ideal Cement Co. was the largest individual quarry operator, and all output was used in manufacturing cement, except for a small quantity employed as rock dust in coal mines. Production was reported also by the Colorado Fuel & Iron Corp. for use as a refractory limestone; Colorado Limestone Co., fluxing limestone; Frank H. Norberg Co., limestone for sugar refining; and V. D. Coleman & Co., Aspen Ridge, dimension granite for monuments. Colonna Co. of Colorado, Inc., producers of 13 colors of terrazzo chips, reported shipments of flooring materials to markets in many States and began to ship roofing chips to Florida during 1956. Crushed sandstone for refractory use was reported by Ray B. Sturbaum, Standard Fire Brick Co., and Laclede-Christy Co. The Colorado State Penitentiary at Canon City reported 600 tons of crushed granite.

The production of crude gypsum increased 43 percent owing to completion of construction and operation of the Florence plant of Fibreboard Paper Products Co.—the only gypsum wallboard plant in the State. Crude gypsum was used in manufacturing cement at the Portland plant of Ideal Cement Co. and sold as a soil conditioner by the U. S. Soil Conditioning Co. The latter company reported employing 12 men at its quarry and mill and shipped sacked soil-conditioning materials to markets in Texas, New Mexico, Colorado, Arizona, and other States. Expansion of the operation is contemplated for 1957, with plans including production of poultry grits. The Coaldale quarry owned by Ideal Cement Co. and operated by Nat Senatore was sold to Fibreboard Paper Products Co., with the provision that Fibreboard would continue to provide Ideal Cement Co. with the gypsum required for its cement plant.

Output of clays dropped 67 percent, owing to lack of any productive activity by the Rocky Mountain Fire Clay Co., John B. Silengo, and Lovisone & Colarelli. Laclede-Christy Co. carried on the only active mining at its Flint mine.

No private contractors produced sand and gravel in 1956; all output was mined by construction and maintenance crews of the State and county highway departments and the city of Canon City.

Mining of pegmatites and recovery of feldspar and mica continued to play minor roles in the mineral industry of Fremont County. The Mica Lode, owned by International Minerals & Chemical Corp. and leased to a number of operators, was the largest feldspar producer.

Digitized by Google

Shipments were reported also by Kenneth R. Cox from the Devil's Hole, Cox and Isabell from the Ridge View, and Arko & Kalbach, K. J. Smith, and others from scattered prospects. Scrap mica sold to the Pueblo grinding plant of International Minerals & Chemical Corp. was reported by Arko & Kalbach, K. R. Cox, A. Ellis, F. & W. Hamilton, A. Lockhart, R. L. Owens, and Schward & Bouchard.

Gem-stone production in 1956 rose to $1,220 and consisted of alabaster, agatized wood, coprolite, and satin spar from deposits near Howard and Garden Park.

Output of coal from 21 mines increased 11 percent over the preceding year. The mines (20 underground and 1 strip) employed 125 men.

The county source of petroleum was the Florence-Canon City field, discovered in 1862; crude oil from the field was shipped to the refinery at Alamosa.

Two mines operated by the Carson Mining & Development Co. and by William Ogden & William Harvey, Jr., supplied the small quantities of gold, silver, and copper reported for the county in 1956.

Beryl from 12 mines in the county, was sold to the Beryl Ores Co., Arvada, and the International Minerals & Chemical Corp., Parkdale. Elmer Lockhart, who operated the Mica Lode, was the leading beryl producer in the county. Other major producers included Arko & Kalbach (partnership), Kenneth Cox, R. L. Owens, and Ken J. Smith.

Uranium exploration was conducted at the Snooper-Dickson claims by Juniper Oil & Mining Co. and on the Sunshine claim by the J. M. Huber Corp. Two small shipments were made during the first 6 months of the year by the Ben River Mining Co. from its Claim No. 2 and by Parkdale Uranium Co. from its Misery Mine No. 7.

**Garfield.**—Garfield County was a source of coal, natural gas, stone, and uranium ore. Additionally the county was the center of shale-oil activity and an important processing point for uranium-vanadium ore.

Natural gas was produced from the Garmesa and Twin Buttes fields. Renewed interest was shown in the Garmesa field area. The Garmesa field was discovered in 1925 and was known to produce a gas with a high carbon dioxide content. During 1956, Standard Uranium Corp., drilling 2.5 miles northwest of the established field, was credited with discovery of a gas with a higher heating value. Three additional development wells were completed by year end—2 successful, 1 dry.

A slight increase in the output of limestone by Frank H. Norberg Co. was reported in 1956. Major uses for the crushed limestone were as flux, and in sugar refining, concrete aggregates, and the production of lime.

Uranium ore was shipped during the first 6 months of the year from the End of Trail No. 2 and Mark No. 2 claims by W. L. Weaver and Black Hope Uranium Co., respectively. Exploration drilling for uranium was carried out by Mid-Continent Uranium Corp. on its U–V group of claims.

At Rifle, Union Carbide Nuclear Co. operated its 280-ton-per-day uranium-vanadium processing plant. During the year the company began to construct a larger plant to replace existing facilities. The

Digitized by Google

new plant was to operate in conjunction with upgrading plants at Slick Rock, San Miguel County, and Green River, Emery County, Utah.

In midyear the Federal Bureau of Mines oil-shale test plant at Rifle was closed. Bureau personnel maintained the plant on a standby basis with funds supplied by the Department of the Navy. Union Oil Co. of California continued to construct its pilot-plant oil-shale retort on Parachute Creek, 12 miles north of Grand Valley. Initial testing was expected to begin early in 1957. Additionally, at Haystack Mountain, Sinclair Research Laboratories, Inc., continued experiments in underground in-place retorting of oil shale.

**Gilpin.**—Eight lode mines producing gold, silver, copper, lead, and zinc, 3 placer gold mines, and 1 tungsten mine were active in the county in 1956, compared with 6, 1, and 4, respectively, in 1955. The United Mining & Leasing Corp. explored the Two Sisters mine and mined ore from the Carroll mine from January 1 to June 1, 1956. The ore was treated in the company 50-ton-per-day concentration mill near the mine at Central City. The Cherokee Uranium Mining Corp. had a substantial production of gold, silver, copper, and lead from ore mined from the Cherokee-Widow Woman mine (incidental to exploration during 1956) and milled at the Goldridge mill owned by the company.

Other mines in the county from which ores of gold, silver, lead, and zinc were produced included Dulajene (dump), Federal, Justice, Patch, and We Got Em. Placer gold containing a total of 9 fine ounces of gold and 2 ounces of silver was recovered from the Anna Mae, Gregory Gulch and Clear Creek, and Fool's Luck placer mines. The Glendale mine, operated by William Quiner, was the one tungsten producer in Gilpin County in 1956.

**Gunnison.**—Coal produced from 9 mines employing 228 men furnished 44 percent of the total value of minerals attributed to Gunnison County in 1956. Approximately half of the coal was sold in out-of-State markets, primarily for Utah coke ovens.

Production of metals (although individually less important than coal) formed, in the aggregate, 55 percent of the total value of minerals.

The Keystone mine of the American Smelting and Refining Co. supplied most of the metal output in Gunnison County. It ranked third in silver and zinc and fourth in lead output in the State. The ore was treated in the company 200-ton-per-day flotation mill, and lead and zinc concentrates produced were shipped to company smelters at Leadville, Colo., and Amarillo, Tex.

With 2 exceptions, all other metal producers reported outputs of less than 100 tons of ore during the year. The Atlas Uranium Corp. mined 300 tons of silver ore from the Hawkeye mine between October 1 and November 30, 1956. The ore, treated in the company 50-ton-per-day mill, yielded 11 tons of concentrate, containing 2 fine ounces of gold, 1,011 ounces of silver, 922 pounds of lead, and 318 pounds of zinc, which was shipped to the Arkansas Valley plant of the American Smelting and Refining Co. Ed G. Van Der Linden produced small quantities of beryl and columbium-tantalum from the Lucky Hill Mineral No. 2 mine and sold it to Beryl Ores Co. of Arvada.

Nonmetals produced in Gunnison County in 1956 consisted of 2,000 tons of potash feldspar by the C S & H Mining Co. at its Last

Digitized by Google

Chance mine, 5,000 of paving gravel by the county highway department, and a small quantity of dimension and crushed marble by the Basic Chemical Corp. and Colo-Texas Stone Co. The county highway department also reported using 10,800 tons of crushed limestone in connection with highway construction and maintenance.

**Hinsdale.**—The Hinsdale County Highway Department quarried the 28,000 tons of sand and gravel produced in 1956.

Small tonnages of ore carrying gold, silver, copper, lead, and zinc were shipped to the Arkansas Valley plant of the American Smelting and Refining Co. from the Czar group by John R. Wagner and from the Pelican group by Frank M. Mendenhall & J. R. Pray and by Interstate Mining Co.

**Huerfano.**—Coal was produced from 9 mines employing 64 men. The Morning Glory mine (operated by the Morning Glory Coal Co.), the Calumet (operated by the Decarbon Coal Co.), and the Gordon (operated by the Skinner Coal Co.) furnished approximately three-quarters of the county coal output.

The Chamblin mine of Standard Fire Brick Co. continued to be the only active clay mine in the county; production reached 9,500 tons in 1956 compared with 8,000 tons in 1955. The mine was operated for 217 days, and 8 men were employed. The raw clay was used in manufacturing heavy clay products, firebrick, and fire-clay mortar. Sand and gravel production was recorded at 321,000 tons; output resulted from highway contracts let by the State highway department. Domenic Leone Construction Co. and Pioneer Construction Co. were the private contractors engaged in this work.

During the first 6 months of the year the Security Exploration Corp. of Colorado shipped a small quantity of uranium ore from the Anal No. 1 mine.

**Jackson.**—Production of crude petroleum more than doubled over the previous year, as output from the Battleship field and North McCallum field (also a source of natural carbon dioxide) increased substantially. Cabeen Exploration Co. was credited with discovering the Canadian River field. The new field produced gas from the Muddy, Dakota, and Lakota sandstones; the latter unit also produced oil. Some difficulty was encountered at the initial well site when gas broke through to the surface from below the cased zone. The blow-out was brought under control later.

Coal was produced from the Marr strip mine.

Although fluorspar production at the Northgate mines (Whale pit and Two Hundred Level mine) of Ozark-Mahoning Co. lagged during the summer owing to expiration of the Government stockpile and price-support program, total production in 1956 was only slightly lower than 1955. During the third quarter of 1956 the stockpiling program was re-established and full-scale mining resumed. An average of 19 men was employed for 259 days during 1956 in underground and open-pit mining and 28 men for 326 days at the company mill near Cowdrey.

The Ozark-Mahoning Co., one of the leading producers of Acid-grade fluorspar in the United States, acquired the Northgate property of the Colorado Fluorspar Corp. in April 1951. This deposit in the Copper Ridge mining district ranks as one of the largest west of the Mississippi River. In 1956 open-pit operations were carried on from

Digitized by Google

May to October. Wagon drills broke the ore and waste. The ore was loaded into 10-ton trucks and hauled 3 miles to the mill; waste was loaded into 5-yard dumpsters by a 1-yard shovel and hauled a short distance to waste dumps; and an ore-to-waste ratio of 1:3 was maintained. Some 4,800 of the total 13,000 feet of vein system has been developed underground. Conventional and modified systems of shrinkage stoping were used. The latter method employed drawpoints and a longhole method of breaking. Four battery locomotives were used to haul the ore to the mill hopper and the development waste to the dumps.

The production of Acid-grade concentrate results from use of a flotation process to treat the complex ore. The principal mineral, fluorite, is associated with calcium carbonate, iron oxide, manganese, ilmenite, and iron sulfide. The grinding circuit consisted of a rod mill, ball mills, and spiral and centrifugal-type classifiers. Concentrate-handling facilities were comprised of filters, rotary drier, and dry-concentrate storage bin, as well as a filter-cake storage building. Concentrate was hauled 3 miles to either the Kings Canon or the Northgate railroad siding on the Union Pacific Railroad. The mill operated 24 hours per day at a daily rate of 120 tons.

All sand and gravel output in 1956 was classified as Government-and-contractor production and resulted from a highway contract let by the Colorado Department of Highways; Northwestern Engineering Co. was the contractor.

**Jefferson.**—The value of nonmetal output in Jefferson County during 1956 reached $1.6 million (98 percent of the total value of all mineral production, exclusive of uranium). Jefferson County remained the State's outstanding producer of clay, as well as one of the principal sources of sand and gravel. Mine production of raw clay reached 237,000 tons in 1956, a 41-percent gain over 1955. Building construction—both residential and industrial—was responsible for the gain.

In 1956, 19 opencut and underground mines were active; the largest was the Golden Brick Co. fire-clay pit near Golden. George W. Parfet Estate, Inc., Rockwell and Apex fire-clay mines was the second-ranking producer, followed by Robinson Brick & Tile Co., Lariat fire-clay mine, and the Chieftain, Navajo, Stranger, and Vermillion miscellaneous-clay mines. H. M. Rubey Clay Co. (Rubey mine) remained a major producer of fire clay. Production was also reported by Lakewood Brick & Tile Co., miscellaneous clay (Lindsay pit); Fred S. Caldwell, miscellaneous clay (Caldwell Clays); Denver Fire Clay Co., fire clay; John L. Harvey, miscellaneous clay; Viola Doughty, fire clay; Denver Brick & Pipe Co., fire clay (Johnson and Strainland mines); Christopher Bennetts, fire clay (Lindsay pit); Denver Terra Cotta Co. fire clay (Plastic Siding); and Coors Porcelain Co., fire clay.

Because of a higher average price, crude-feldspar output rose to 11,000 long tons in 1956 compared with 995 long tons in 1955. The Madonna Lode, the largest producing mine, was operated by L. M. Hollingsworth, R. H. Vahsholtz, and V. O. Eagle. R. V. McGuire and Olett Mining Co. worked the Lone Lode, the second-ranking producing property, followed by Dale Dunkle, Miller Lode; Vern Blomquist, Clark No. 1 mine; D. W. Powell, Powell and Friend Bros.

Digitized by Google

mine; C. A. Bevans, Circle S mine; L. M. Hollingsworth, Delbert No. 1; Albert Miller, Riley mine; and Elements, Inc., Elements mine.

Sand and gravel was another important source of income to the mineral industries of the county during 1956. The total output rose to 987,000 tons, a 50-percent increase over 1955. Of this total, only 230,000 tons was Government-and-contractor output quarried by C. L. Hubner Co., Peter Kiewit Sons' Co., and Schmidt Construction, Inc., as contractors for the Colorado Department of Highways. In comparison, 757,000 tons was commercial production and consisted of structural sand and gravel and paving sand and gravel. The largest producer in 1956 was the Rio Grande Co., followed by Western Paving Construction Co., Suburban Reddi-Mix Sand & Gravel Co., and H. N. Lee Sand & Gravel Co.

Rare-earth-mineral production was reported by Elements, Inc., which sold a small quantity of samarskite to the Beryl Ores Co. of Arvada. Sales of yttrium-bearing fluorite to Rare Earth Chemical Co. were reported by Beal & Associates, N. F. Kurtz, and several smaller producers. The crude material was processed by the Denver plant of Rare Earth Chemical Co., and heavy rare-earth oxides were recovered and sold.

In all, 27 tons of scrap mica was produced as a byproduct of pegmatite mining during 1956. Ben Waltz, operating the Biggers mine, was the leading individual producer. All crude material was sold to the Beryl Ores Co., Arvada, for grinding. Ornamental stone was also reported by Baders Minerals from the Crystal Peak area, where 250 pounds of amazonite valued at $500 was collected.

During the first half of the year 6 operators shipped uranium ore from 8 properties. The Ralston Creek mine, operated by Denver Golden Uranium & Oil Co., was the most productive, followed by the company Aubrey Ludwig mine. J. L. Mann property (operated by Uranium Enterprises, Inc.), the Leyden mine (operated by Moreno Uranium Corp.), and the Section 32 mine (operated by Foot Hills Mining Co.) also contributed an important share of county uranium output.

Gold and silver were recovered as byproducts at four sand-and-gravel washing and screening plants. W. B. Kerkling was by far the largest gold and silver producer of the four.

Considerably less beryl was produced than in 1955. Production was reported from eight individual operations; Elements, Inc., at the Little Abner mine, and Leo Sabin, at the Sabin mine, were the leading producers. All of the beryl was sold to the Beryl Ores Co., Arvada.

Additionally, petroleum was produced from the Soda Lakes field, discovered in 1955.

**Kiowa.**—Stanolind Oil and Gas Co. was credited with discovering the Colt gasfield (sec. 7, T. 20 S., R. 52 W.) which produced from the Morrow sandstone. In the Southwest Eads field, one gas well producing from the Morrow sandstone was tested for oil at the Marmaton horizon by Continental Oil Co., with reported success.

**Lake.**—The entire output of molybdenum from Colorado (which was below that in 1955) came from the Climax Molybdenum Co. Climax mine in Lake County. Molybdenum was again the dominant metal mined in the county, as it has been since 1929, when the value

Digitized by Google

of molybdenum produced first exceeded the combined value of gold, silver, copper, lead, and zinc. Except for 4 years, 1920–23, the mine has been a steady producer since the first concentrate was shipped in 1918.

In its annual report to the stockholders, the Climax Molybdenum Co. reported that the production of molybdenum during the past 5 years was:

| Year | *Pounds of molybdenum contained in concentrate* |
|---|---|
| 1952 | 23,874,408 |
| 1953 | 37,306,341 |
| 1954 | 42,544,795 |
| 1955 | 43,043,138 |
| 1956 | 37,489,000 |

The average daily production of ore mined and treated in the mill totaled 32,000 tons during 1956. This rate had been increased to 34,000 tons by year end. Despite this record tonnage, the necessity of drawing lower grade ores from the mine caused actual production of molybdenum to fall below the production of 1954 and 1955.

The company reported that sales of molybdenum contained in all forms during the year was 37,132,383 pounds valued at $50,693,847. For the first year since 1949 all sales were to industrial consumers. From 1950 through 1955 a sizable portion of the Climax production was sold to the Federal Government.

In addition, tungsten and tin were recovered by Climax as by-products of the molybdenum ore. The tin recovered was not sold and was not recorded as production in 1956. According to the company, the present byproduct facilities are limited, and plans were being completed in 1956 to expand and allow maximum treatment and recovery from the entire tonnage mined.

The total value of gold, silver, copper, lead, and zinc produced in Lake County in 1956 was $1.5 million, compared with $1.1 million in 1955, a 32-percent increase. Most of this increase reflected the output from the new operation at the Irene, Hellena & Julia Fisk shafts—a joint venture on an equal basis between American Smelting and Refining Co. (ASARCO) and Resurrection Mining Co. (100-percent owned by Newmont Mining Corp.). The joint operation, managed by Resurrection Mining Co., mined known ore bodies and conducted exploration and development work on individual company neighboring properties in the Sunday-Ibex-Iowa Gulch area. Ore production from development headings and stopes in ore bodies tributary to ASARCO's Irene shaft was begun in July 1956; this was followed by ore production from Resurrection's Iowa Gulch through the Hellena & Julia Fisk shafts. According to the Newmont Mining Corp. annual report for 1956, 36,873 tons of ore, containing 4.0 percent lead, 7.45 percent zinc, and 4.83 ounces of silver per ton, was mined during the year by the joint venture. The scheduled production rate (12,000 tons of ore per month) was not reached by the close of the year.

New buildings at the Irene included a modern fireproof changehouse, warehouse, headframe house, ore-truckloading enclosure, and hoist-compressor house. A modern 400-horsepower hoist and three 200-horsepower compressors were installed. The No. 2 unit of the Resurrection mill was rehabilitated and by the close of the year was operat-

Digitized by Google

ing at its capacity of 425 to 450 tons of ore a day on a 7-day-week basis.

On May 17 the Resurrection No. 2 surface plant burned, ending—at least temporarily—the Robert L. Jones lease operations that had employed 8 to 12 men since July 1953. Ellis Webster and associates continued work on their sublease at the Ibex. Other activities in the area by leasers included diamond drilling on the Ollie Reed by George Peschel and associates and operations at the Hayden shaft by the Cadwell Mining Co. Lead and silver were recovered by the American Smelting and Refining Co. by resmelting lead slag from its dump at the Arkansas Valley smelter at Leadville. It also purchased ores and concentrates of gold, silver, copper, and lead from various Colorado districts and concentrates, residues from zinc smelters, and other material from outside the State.

Nonmetals continued to supply only a small portion of the total mineral output for the county; pyrites and stone were the only commodities produced in this group. Climax Molybdenum Co. remained the only producer of pyrites; output resulted from the recovery of pyrite concentrate—a byproduct of the treatment of molybdenum ore. All output was used in manufacturing sulfuric acid at the Denver plant of Allied Chemical & Dye Corp. The production of sandstone (quartzite) at the Pineview Placer of Standard Fire Brick Co. remained relatively the same during both 1955 and 1956 (4,600 and 4,900 tons, respectively). All crude material was shipped to the company plant at Pueblo for manufacturing refractory brick.

**La Plata.**—The major activity in La Plata County during 1956 was development drilling in the Bondad-Ignacio natural-gas field. Drilling in this area brought in the bulk of the 48 successful gas-development wells completed. The Pacific Northwest Pipe Line Co., Pubco Petroleum Co., and United States Smelting Refining and Mining Co. were most active in the field. Wildcatting activity increased substantially over previous years, and one new gas discovery was reported.

Natural-gas production was reported from the Bondad-Ignacio, Barker Dome, Blanco, and Red Mesa fields. Barker Dome and Red Mesa fields also furnished the county output of petroleum.

Twelve coal mines employing 40 men were responsible for the county coal output during 1956.

Stone (principally miscellaneous stone) was the most important nonmetal in La Plata County. Crushed limestone was also produced; all output was reported by the Burnett Construction Co. and was used as concrete road metal. The Burnett Construction Co. also reported the production of sand and gravel, and additional output was indicated by the Hunt Construction Co. as contractor for the Colorado Department of Highways.

Small shipments of ore from the Copper Age mine operated by Radium King Mines, Inc., and the Muldoon mine operated by Herman Dalla & Herman Todeschi made the entire gold, silver, and copper output in the county in 1956.

A small quantity of uranium ore was shipped from the Blackhawk mine by the Barnett Mining Co. At Durango the Vanadium Corp. of America operated its 430-ton-per-day uranium-vanadium mill to capacity. The mill derives much of its feed from the company-owned Monument No. 2 mine in Apache County, Ariz. During 1956

Digitized by Google

a scrubber unit was added to treat dust and gases from the roaster, and a new slime-treating unit was near completion.

**Larimer.**—Production of types I, II, and III, oil-well, waterproof-portland, and masonry cements continued to be the principal mineral-industry activity in the county during 1956. The Ideal Cement Co. operated its Boettcher dry-process plant for 365 days, employing 123 men. Two rotary kilns were operated 337 and 343 days during 1956; and the clinker, after grinding and sacking, was shipped to California, Nebraska, New Mexico, and Wyoming, in addition to local distribution points.

In terms of value, stone was the second most important product of the mineral industry of Larimer County. During 1956 limestone was once again the dominant type of stone produced. Ideal Cement Co. was the major quarry operator; and, except for a small quantity used as filler for asphalt, the bulk of the output from the Boettcher quarry was used in manufacturing cement. Frank H. Norberg Co. also was active and reported production at its Rex quarry; all output was used in sugar refining. In 1956 Larimer County producers reported output of 8,400 tons of dimension sandstone, which consisted of rough architectural, rough construction, rubble, dressed stone, and flagging. Rocky Mountain Quarry Co. produced 290 tons of rough monumental granite.

Of the 493,000 tons of sand and gravel produced in 1956, the greater proportion resulted from highway contracts let by the Colorado Department of Highways and construction activities of the county highway department. Private contractors engaged in this work were Herren & Strong, Carl V. Hill, C. L. Hubner Co., Lawrence Construction Co., Northwestern Engineering Co., and Pendleton Garner Construction Co. Commercial production consisted of structural and paving sand and gravel reported by Loveland Ready-Mix Concrete, Inc., and Sterling Sand & Gravel Co.

The steady demand for gypsum in manufacturing cement was reflected in increased mine output by E. W. Munroe at his Goodwin quarry. In contrast, output at the Loveland quarry of United States Gypsum Co. declined 15 percent below 1955. The gypsum quarried at the Loveland quarry is used in manufacturing plaster products in company plants outside of Colorado; a portion is returned to Colorado in finished product form. The local (Colorado) market for plaster products produced at out-of-State plants was affected by operation of the new plaster-products plant at Florence, Fremont County.

Pegmatites—feldspar and mica (hand-cobbed and scrap)—were valued at $6,900 in 1956. Feldspar, shipped to the Denver grinding plant of International Minerals & Chemical Corp., was reported by B & M Mines, Inc., Lucas Mining Co., and J. W. Strait. L. E. Coosh shipped a small quantity of hand-cobbed mica to the Custer (S. Dak.) GSA Purchase Depot; B & M Mines, Inc., Mattox & Sabin, and H. A. Snider sold scrap mica to the Beryl Ores Co. of Arvada.

Petroleum (the county's third-ranking mineral in value) was produced from the Fort Collins, Wellington, Clark Lake, Loveland, and Berthoud fields. Production rose 40 percent over that of the preceding year to a total of 181,000 barrels. Increased output was derived from the Fort Collins and Loveland fields, where new pro-

Digitized by Google

ductive horizons were discovered during 1955. During 1956 oil was also produced from the Dakota formation of the Loveland field.

E. G. Talkington & Clide Thompson made one small shipment of silver ore (carrying some copper) to the Garfield smelter from an open-pit operation at the T & T mine in Larimer County in 1956.

Beryl output in the county was valued at $18,000 in 1956, compared with $3,000 in 1955. Production in 1956 was reported from 15 individual operations and was sold to Beryl Ores Co., Arvada, and to the GSA Government Depot. The outstanding beryl producer in the county was Phil-Mar Oil Co. on the Phil-Mar group of claims. H. A. Snider, who operated the Emerald Gem mine, was also a substantial beryl producer in the county in 1956.

In the first half of 1956 some uranium ore was shipped from the Eureka mine by New Mar Uranium Co. and from the Robinson Lease by the Uranium Queen Exploration Co.

**Las Animas.**—The mining of coking coal for use in the Pueblo blast furnaces continued to be the most important mining activity in Las Animas County during the year. During 1956, 12 mines were active and 1,172 men were employed. The 3 dominant operations of the Colorado Fuel & Iron Corp. (the Allen, Frederick, and Morley mines) were reduced to 2, with closing of the Morley mine in May (see commodity section).

Stone and sand and gravel provided the bulk of the income from nonmetals to the mineral industries of Las Animas County during 1956; all production was prompted by construction and maintenance of roads by the State and county highway departments.

The Scott-Ruiz Coal Co. continued to be the only clay producer and the 7,500 tons reported was classified as fire clay used in manufacturing firebrick and block.

Rose agate valued at $100 was collected in and around Kim.

The Nina View field was a source of natural carbon dioxide.

**Logan.**—Logan County continued to be an important source of crude petroleum in the State, as well as a producer of natural gas, natural-gas liquids, and sand and gravel.

Total crude-oil output (derived from 61 fields) was less than in 1955, as was total drilling activity, which declined from 331 holes to 192. Six new oil and two new gas discoveries were reported out of a total of 94 wildcat wells drilled. The new oilfields were the Amber, Beall Creek, Goat Hill, Loula, Prairie View, and Prewitt. The two gasfields were the Columbine and Knoll, both of which were shut in at year end.

Most of the county's 61 oilfields also yielded natural gas. Additionally, natural-gas liquids were produced from 3 plants at Sterling—2 operated by Ginther, Warren & Ginther and 1 operated by the Kansas-Nebraska Natural Gas Co.

Sand and gravel production in Logan County in 1956 was 335,000 tons valued at $208,000. Of this amount, 288,000 tons was produced by construction crews of the Colorado Department of Highways, Domenic Leone Construction Co. as contractor, and the county highway department. The Sterling Ready Mix Co. quarried 47,000 tons of structural sand and gravel, which was used in preparing ready-mix concrete.

Digitized by Google

**Mesa.**—The principal mining activity in Mesa County was the mining and milling of uranium ore. Coal mining (followed by excavation of sand and gravel) also formed an important part of mineral-industry activities. Natural gas, clays, stone, and gem stones also were reported.

During the first 6 months of the year, 75 individual properties produced uranium ore in Mesa County. Ore was shipped to 5 different mills and 1 buying station; however, the mills at Grand Junction and Rifle received the major share of the material.

Climax Uranium Co., one of the major operators in the county, reported completion of a shaft and an incline on its properties on Outlaw Mesa and the start of an adit on Beaver Mesa to enter ore discovered by drilling in 1955.

At Grand Junction the mill operated by Climax was modified further during the year. In September, a continuous solvent-extraction circuit was completed and was reported to be operating satisfactorily.

Production of coal (7 mines, 57 men) increased substantially over the 1955 output and totaled 70,360 tons. At Cameo a new coal-fired thermal-electric plant was near completion. The plant was to be supplied with coal from local sources.

Demand for sand and gravel for building and highway construction provided work at seven operations in Mesa County in 1956. Sand and gravel was produced by construction and maintenance crews of the county highway department, Lowdermilk Bros. as contractor for the Colorado Department of Highways, Hinman Bros. Construction Co. as contractor for the Federal Bureau of Public Roads, and by a contractor for the city of Grand Junction. Commercial structural and paving sand and gravel were reported by the Whitewater Sand & Gravel Co., at Whitewater and Grand Junction, and the United Sand & Gravel Co., Inc.

Dimension sandstone produced by Hinman Bros. Construction Co. for the Federal Bureau of Public Roads was used as rubble on a highway project. The Grand Junction Brick Co. continued to mine miscellaneous clay for use at its Grand Junction brick plant, but output in 1956 was considerably below 1955. Two hundred pounds of dinosaur bones was collected in the Glade Park region.

Sources of natural gas within the county were the Asbury Creek and Bar X fields. Three gas discoveries were reported for the year: One was a new productive zone in the Bar X field; the second was an unnamed discovery 2 miles west of the Highland Canal field; and the third was the Divide Creek field in the eastern part of the county.

Near Fruita, west of Grand Junction, the American Gilsonite Co. began to construct a refining plant to produce gasoline and metallurgical coke for gilsonite mined at Bonanza, Utah, and transported to the refinery by a 70-mile pipeline. The plant was to have an initial daily capacity to treat 500 tons of raw gilsonite producing 250 tons of metallurgical coke and 60,000 gallons of gasoline. When in full production, a daily plant capacity of 1,000 tons would be achieved, according to reports.

**Mineral.**—The Emperius Mining Co. Emperius mine furnished most of the gold, silver, copper, lead, and zinc output in the county in 1956 and was one of the major silver, lead, and zinc producers in the State.

Digitized by Google

The output of lead and zinc in 1956 was greater but of silver was less. A new mill and power plant, replacements for those destroyed by fire in August 1955, were placed in operation in June 1956.

The Outlet Mining Co. had a substantial output of silver and lead from the Outlet Tunnel in 1956. The Outlet Mining Co. and Sublet Mining Co. were granted a DMEA lead-zinc exploration project for $108,506 on the Outlet Tunnel mines during 1956. Gormax Mining Co. (Gordon & Maxine Smith) made one small shipment of lead ore from the Phoenix mine and conducted work under a $56,720 DMEA contract for lead-zinc at the Gormax mine.

**Moffat.**—Production of mineral fuels—petroleum, coal, natural gas, and natural-gas liquids—continued to be the major activity of the mineral industries of Moffat County in 1956.

Crude petroleum came from 12 fields. Greater output for the year resulted from increased production from the Hiawatha field and more importantly the Thornburg field (in which oil was discovered during 1955). It was in the latter field that the largest single concentration of development drilling was carried out. Ten development oil wells were completed by Continental Oil Co.—nine of them successful.

A new gas field (the North Craig) was reported by United States Smelting Refining and Mining Co. The field is 10 miles northeast of the Craig field.

Coal production came from the Red Wing mine operated by the Colowyo Coal Co., which shipped almost half of its output to out-of-State markets. The firm employed 38 miners during 1956.

Uranium ore was mined from 9 properties during the first 6 months of the year. The major operator during the period was Trace Elements Corp. Shipments were also reported by Counts & Henderson from the Cleta group and Seelco Mining Co. from the Sugar Loaf mine.

An AEC contract for a mill at Maybell was renegotiated during 1956. The mill, of 300-ton-per-day capacity, was to be built and operated by Trace Elements Corp.

Sand and gravel production in Moffat County in 1956 was predominantly the commercial output of Craig Sand & Gravel Co. Sand and gravel was also reported by the county highway department crews and used in constructing and maintaining county roads.

Cold Springs Minerals was active at the Red Jacket Nos. 1 and 2 mines from May 15 to July 15, 1956. One small shipment of copper ore was made from these mines to the American Smelting and Refining Co. smelter at Garfield. The Western Exploration Co. shipped a substantial quantity of copper ore, containing some gold and silver, from the Bromide No. 1 dump to the smelter in 1956.

**Montezuma.**—The value of minerals attributed to Montezuma County dropped from $245,000 in 1955 to $44,000 in 1956 owing to the decreased output of sand and gravel used in highway-construction projects. During 1956 sand and gravel was produced by the State highway department (Hunt Construction Co., contractor). A. S. Horner, contractor for the Federal Bureau of Public Roads, produced some crushed miscellaneous stone.

Petroleum and natural gas were derived from the Dove Creek field, and natural carbon dioxide gas was produced from the McElmo field.

No coal production was reported for the year.

Digitized by Google

Uranium ore was shipped during the first half of the year from the Roberta Jean mine by the Owen & Ringwold Mining Co.

Exploration and development work was conducted at the Gold Dollar mine by the First National Oil & Mineral Co. from July to November in 1956, and one shipment of gold ore carrying some silver and copper was made to the Leadville smelter.

**Montrose.**—Uranium mining and milling formed the principal activities of Montrose County mineral industries in 1956. Production of sand and gravel, salt, coal, and gem stones also was reported.

Uranium ore was produced from 138 properties and shipped primarily to the Uravan and Naturita mills; ore was also shipped out of the county to mills at Grand Junction, Rifle, and Durango.

Expansion of the Union Carbide Nuclear Co. mill at Uravan was completed and at year end the daily plant capacity was 850 tons. The Vanadium Corp. of America operated its 350-ton-per-day mill at Naturita throughout the year. Additionally, a contract was negotiated between the AEC and Atomic Fuels Extraction Co. for constructing and operating a 200-ton-a-day uranium mill at Bedrock.

Some of the more important mines (in terms of production for the first 6 months of the year) were as follows:

| Mine: | *Operator* | *Location* |
|---|---|---|
| AEC Mining Lease No. 10 | La Salle Mining Co | Club Mesa. |
| AEC Mining Lease No. 37 | Shattuck Denn Mining Corp. | Do. |
| AEC Mining Lease No. 39 | Golden Cycle Corp | Atkinson Mesa. |
| AEC Mining Lease No. 47 | Worcester Mines | Do. |
| Hummer | Union Carbide Nuclear Co. | Monogram Mesa. |
| Mineral Joe No. 1 | Climax Uranium Co | Do. |
| Mineral Joe No. 2 | ----do | Do. |
| Opera Box | Union Carbide Nuclear Co. | Do. |
| Oversight | ----do | Do. |
| Republican | Vanadium Corp. of America | Long Park. |

These properties produced 54,800 tons of ore during the 6-month period, or 45 percent of the county total.

Salt in brine recovered from a well operated by Union Carbide Nuclear Co., sand and gravel produced by Harrison & Atchison Co. as contractor for the State highway department, and jasper and dinosaur bones collected by Ray Cook and San Miguel Woodcraft & Gem Shop from the Long Park and Naturita Canyon areas constituted all nonmetal production in Montrose County in 1956.

At Nucla a coal-fired thermal-electric plant was being constructed. Coal for the plant was to be supplied from a new mine in the area by the Edna Coal Co., according to a contract signed during the year.

**Morgan.**—Petroleum continued to be the most important mineral produced in Morgan County. Associated with the production of crude petroleum, which came from 30 fields, was the output of natural gas (produced from most of the oilfields) and natural-gas liquids (produced from 2 plants at Fort Morgan operated by Continental Oil Co. and Pure Oil Co.).

In October the Adena field—leading producer in the county and second in the State—was placed under unit operation with Pure Oil Co. designated as operator. Unit operation permitted the use of secondary recovery methods, which will increase significantly total recoverable reserves of the field.

Digitized by Google

Drilling activity dropped from the preceding year—153 completed holes compared with 253 in 1955. The 74 wildcat holes drilled resulted in 7 oil discoveries and 1 gas discovery. One of the more important discoveries was the Orchard field (T. 4 N., R. 60 W.) which produced from both the "D" and "J" sand members of the Dakota formation.

Sand and gravel production in 1956 rose to 223,000 tons as a result of increased highway construction in the county. Commercial output was recorded for the Builders Aggregate Co. and Green Bros. Contractors, whereas Blanchard Construction Co., as contractor for the Colorado Department of Highways, and construction crews of the county highway department were responsible for Government-and-contractor production.

**Ouray.**—The King Lease, Inc., at the Camp Bird mine near Ouray—the principal producer of metals in the county since the mine was reopened by Joseph King in 1926—was active in 1956. It was the seventh-ranking silver and eighth-ranking gold, lead, and zinc producer in the State. A total of 33,871 tons of lead-zinc ore mined and milled in 1956 contained 2,954 fine ounces of gold, 72,552 fine ounces of silver, 158 tons of copper, 582 tons of lead, and 777 tons of zinc. On December 1, 1956, the King Lease, Inc., discontinued operation of the Camp Bird mine and relinquished its lease to the owners, Camp Bird, Ltd., which reported that it will operate the mine.

After 12 years of continuous operation the Red Mountain mill of the Idarado Mining Co. was closed on December 1, 1956, and placed on a standby basis. This 900-ton-per-day mill at the portal of the Treasury tunnel near Red Mountain Pass in Ouray County was operated on ore mined from company properties in San Miguel County. With closing of this mill all ores were diverted and moved via the Mill Level tunnel to the company-owned Pandora mill near Telluride.

**Park.**—Park County was a source of 12 mineral commodities; beryl and the rare-earth metals were the most valuable.

Beryl production, reported from five operations in Park County, was valued at $68,000. G. H. Sager, by far the leading beryl producer in the county and in the State, reported an output of 251,821 pounds of beryl, averaging over 10 percent BeO, from the Boomer Lode 7 miles west of Lake George. This beryl was sold to the Custer (S. Dak.) GSA depot. The four other beryl producers in the county sold their product to the Beryl Ores Co., Arvada.

For the first time in the history of the county the mining of rare-earth minerals was recorded. The Teller pegmatite mine in the Lake George area was the scene of mining activity, and sales of yttrium-bearing fluorite and gadolinite were reported by Edwin Over to the Rare Earth Chemical Co. of Denver. Collection of moss opal, amazonstone, and topaz in the Hartsel and Pine area was reported by L. L. Oliver and the Colorado Mineral Society.

Largely due to increased costs of mining and transportation, the production of crude feldspar in Park County dropped from 14,849 tons in 1955 to 601 tons in 1956. The only producing mines were the Blue Spruce and Knox, operated by Capra & Logan and M. E. Johnson. Crude fluorspar used for metallurgical purposes was reported by Eugene Kleinknecht from the Bear Cat and Morning Star

Digitized by Google

1 and 2 mines. Scrap mica was also produced by H. Douglas and Carl Quist and shipped to the Beryl Ores Co. at Arvada for grinding.

The Buckskin Joe Mines, Ltd., conducted exploration and development work at the Phillips mine from June through December 1956 and shipped 167 tons of lead-zinc ore from the mine to the Resurrection mill for concentration. The ore contained 37 fine ounces of gold, 276 ounces of silver, less than 1 ton of copper, 3 tons of lead, and 13 tons of zinc. In addition to this, 119 tons of ore was mined from 4 other mines in the county. Except for 15 tons which was milled, all of this ore was shipped directly to the smelters to recover gold, silver, copper, lead, and zinc.

**Pitkin.**—Coal mining was the major mining activity in Pitkin County in 1956. Two mines were operated by the Thompson Creek Coal & Coke Corp. and a third, the newly opened Dutch Creek mine, was operated by the Mid-Continent Coal & Coke Co. The 3 mines employed 90 men; all coal mined was shipped out of the State, largely to Utah coke ovens.

Silver and lead were recovered from ore mined by John F. Lewis from the Smuggler mine and shipped directly to the American Smelting and Refining Co. smelter at Leadville, and the United States Smelting Refining and Mining Co. smelter at Midvale, Utah.

**Pueblo.**—The value of mineral production in Pueblo County rose to $1 million, a 6-percent increase over 1955. Clays, sand and gravel, and stone were the only raw mineral commodities mined during the year. Total production of all clays mined in 1956 decreased slightly but not enough to have any economic significance. Pueblo Clay Products Co. (producer of fire clay) was the principal operator, but the company reported the sale of its mine and plant to General Refractories Co. of Lehi, Utah, during 1956. General Refractories Co. will continue to produce raw clay for local consumption, as well as for shipment to its Lehi (Utah) refractory works. Productive activity was also reported by the Colorado Fire Clay Co., Standard Fire Brick Co., and Summit Pressed Brick Co.; the Freeman Fire Brick Co. was idle. Except for 25,000 tons of miscellaneous clay, all mine output was fire clay used in manufacturing heavy clay products, firebrick and block, and fire-clay mortar.

Sand and gravel production was relatively static in 1956, with 114,500 tons classified as Government-and-contractor production and 871,000 tons as commercial output. The principal commercial operators were Broderick & Gibbons, Inc., Fountain Sand & Gravel Co., and Certified Concrete Co. Crushed limestone used as concrete road metal was quarried by Certified Sand & Gravel Co.

**Rio Blanco.**—Petroleum production continued to furnish all but a small fraction of the value assigned to minerals produced in Rio Blanco County. Natural gas and natural-gas liquids, coal, uranium, and sand and gravel were also produced.

The Rangely field, producing from 4 horizons, showed an increased output of 4 million barrels (17 percent) over 1955 and was an important factor in increased petroleum production for the State. Total production for the year from Rangely was 28.1 million barrels. Oil also was derived from the Wilson Creek and North Douglas Creek fields—the latter a new discovery. One refinery and one natural-gas

465877—58——20

Digitized by Google

liquid plant were operated at Rangely by Wesco Refining Co. and The California Co., respectively.

Coal production came from 3 mines—the Rienau, White River, and Blue Streak; these mines employed 12 men.

Uranium ore was shipped during the first half of the year from 8 properties, but the total amount was not large; McAlester Fuel Co. operated 5 of these properties.

**Routt.**—Three stripping operations and 4 underground mines furnished Routt County's coal production—490,000 tons. Employment at the 7 operations averaged 248 men.

The only source of petroleum during the current year was the Tow Creek field; no production was reported from the Oak Creek field.

Nonmetal production in Routt County in 1956 was composed of pumice (volcanic ash) and sand and gravel. McCoy Aggregate Co. continued to ship a significant quantity of scoria to Denver concrete-block manufacturers. The mine is 6 miles northwest of McCoy. Sand and gravel was produced as a result of highway contracts let by the Federal Forest Service to E. J. Rippy & Sons and the Colorado Department of Highways to Colorado Constructors, Inc.

**Saguache.**—All uranium-ore shipments during the first half of the year came from the Los Ochos mine operated by the Gunnison Mining Co. The company obtained an AEC contract in 1956 to construct and operate a 200-ton-per-day uranium mill. The mill is to be at Gunnison, Gunnison County, and will process ore from the Los Ochos mine and the surrounding area.

Saguache County continued to be the leading producer of turquois in the State, but the value of output was almost half of that in 1955. The Villa Grove turquois lode (8 miles west of Villa Grove) produced 300 pounds of crude material. The Pioneer Construction Co., as contractor for the Colorado Department of Highways, quarried 34,000 tons of paving gravel for use in road construction.

The Rawley mine operated by the Costello Lease continued to be the largest metal producer in the county. Lead ore from the mine was shipped to the American Smelting and Refining Co. Arkansas Valley plant for direct smelting, and lead-zinc ore was shipped to the Resurrection Mining Co. mill for concentration. Silver and copper were recovered, in addition to lead and zinc. Smaller quantities of these metals were recovered from ore mined by Jupiter Mining Co. from the Cora group, by Johnston Mining Co. from the Little Jenny mine, by Queen City Mines, Inc., from the Queen City mine, and by Warwick Mines Trust from the Marine Lode mine.

**San Juan.**—The $537,000 total value of gold, silver, copper, lead, and zinc produced in San Juan County in 1956 was double that in 1955 and four times that in 1954. As in 1955, the bulk of the output of these metals came from 5 of the 8 active mines in the county. These mines (operators in parentheses) were: Osceola (Tech-Ser Mining Co.), Lark (D. W. Ruhter), Pride (Barney Blackmore & Associates), Lead Carbonate (Lead Carbonate Mines, Inc.), and Mogul (Grant Gifford).

In the first half of the year, uranium ore was produced by the Dunning Graysill mine operated by the Vanadium Corp. of America. Ore was shipped to the company plant at Durango.

Digitized by Google

**San Miguel.**—Most gold, silver, copper, lead, and zinc produced in the county originated in the Treasury Tunnel-Black Bear-Smuggler Union group of mines of the Idarado Mining Co. The Newmont Mining Corp., which owns 74.2 percent of the Idarado Mining Co., stated in its annual report that during the year 481,700 tons of ore, averaging 0.067 ounce of gold and 1.66 ounces of silver per ton, 1.71 percent lead, 0.64 percent copper, and 2.79 percent zinc, was milled in the company Red Mountain and Pandora mills from the Idarado Mining Co. mines, compared with 274,550 tons in 1955. During the year both Telluride Mines, Inc., and Tomboy Gold Mines, Inc., were absorbed by the parent Idarado Mining Co., creating the largest consolidation of mining properties in the history of the district and totaling over 5,000 acres of contiguous patented claims.

Expansion of the Pandora mill near Telluride was completed in early January; this mill (with the Red Mountain mill in Ouray County) treated all of the ore from the Treasury Tunnel-Black Bear-Smuggler Union group of mines. According to the company, to obtain lower operating costs and greater efficiency, on December 1 the Red Mountain mill was closed, and all ores from the company mines was diverted to the new, larger, and completely rehabilitated Pandora mill for treatment.

Smaller quantities of gold, silver, copper, lead, and zinc were recovered from ore mined by T-Bar Mining Co., Utaco Uranium, Inc., and L. Mills Beam and from cleanup material from the Butterfly and Alta-St. Louis millsites by Albert McClusky.

The entire output of iron ore in Colorado in 1956 was produced from the Iron Springs placer deposit in San Miguel County by C. K. Williams Co. Production in 1956 was one-third less than in 1955. The ore was classed as bog iron (limonite) and used in manufacturing paint.

Uranium ore was shipped from 81 properties in the first half of the year to mills in Colorado and Utah. Some of the more productive were the AEC Mining Leases No. 4, No. 29, and No. 46 (Dulaney Mining Co., Ortmayer Mining Co., and Gayno Mining Co., respectively) and the Raven (F. V. Binder); these four produced almost half of the ore shipped during the period.

Production of sand and gravel and a minor amount of gem stones also was reported.

**Summit.**—As in 1955, the Wellington mine (2½ miles east of Breckenridge) was again the principal base- and precious-metal producer in the county. W. L. Davenport, who has operated this mine continuously since 1947, retired from active management in May 1956 and sold his interest to his two partners, Harold Horn and Marvin Burger, who operated the mine for the rest of the year. W. L. Davenport became associated with Dr. F. F. Gross in reopening and operating the Minnie mine one-half mile east of the Wellington mine on Mineral Hill. From July through December 604 tons of lead-zinc ore was mined and shipped for treatment.

Burke Martin Mines operated the Burke group of claims near Montezuma throughout the year; 52 tons of ore containing 1,740 fine ounces of silver and 2 tons of lead was shipped to the Arkansas Valley plant, and 4,535 tons of lead-zinc ore was milled to yield 124 tons of lead concentrate and 532 tons of zinc concentrate. The lead

Digitized by Google

concentrate was shipped to the Arkansas Valley plant and the zinc concentrate to the American Smelting and Refining Co. smelter at Amarillo, Tex. The metal content of the lead and zinc concentrates was 17,649 fine ounces of silver, 1 ton of copper, 71 tons of lead, and 302 tons of zinc.

Seven other lode mines (in addition to the Wellington, Minnie, and Burke) produced small quantities of gold, silver, copper, lead, and zinc in the county in 1956. One placer mine (Marie No. 1, Marie, Eve No. 1, Eve claims) was operated by Alex Bordoni. The deposit was worked by using a dragline to deliver the gold-bearing gravel to a washing plant to recover the gold.

C. L. Getman made a small shipment of manganese ore (35 percent or more manganese) from the Dillon mine to the GSA, Butte, Mont., Purchase Depot under its "low-grade" program. The ore will be recorded as production in the year when treated and a useful product is shipped from the depot.

**Teller.**—Production of gold in the Cripple Creek district increased from 47,171 fine ounces in 1955 to 52,544 ounces in 1956. The Golden Cycle Corp. continued to operate its 1,000-ton-per-day Carlton custom flotation-cyanidation mill near Cripple Creek and to mine and mill ore from its Ajax group of mines. The entire output of gold ore and mine-dump material from the district in 1956, which came from 11 active mines (including the company Ajax mine), was treated at the Carlton mill. According to the company annual report for 1956, the ore tonnage treated at the Carlton mill was 121,844 tons, with an average gross value of $15.09 per ton in 1956, compared with 100,548 tons valued at $18.31 per ton in 1955.

The Ajax mine (the leading gold producer in the district) ranked second in gold output (next to Treasury Tunnel-Black Bear-Smuggler Union group) in the State in 1956. The Golden Cycle Corp. reported that its production from the Ajax mine was 24,890 tons of ore with an average gross value of $37.18 per ton in 1956 compared with 25,364 tons valued at $42.86 per ton in 1955.

The Cresson mine (operated by the Cresson Consolidated Gold Mining and Milling Co.) followed the Ajax mine in gold output. In its annual report for 1956, the company reported that production from the Cresson mine was 42,501 tons of ore with an average gross value of $12.54 per ton in 1956, compared with 33,717 tons valued at $13.94 per ton in 1955.

Other major gold producers in the district in 1956 included the Grace Greenwood mine and dump operated by LeClair Consolidated Mines Co., El Paso dump by Thomas A. Copeland & James A. Knight, Free Coinage mine by Deadwood Leasing Co., and Vindicator group by United Gold Mines Co. Smaller quantities of gold were produced at the Elkton dump, Empire Lee Mining Co. property, Jeff Davis No. 2 dump, Old Gold mine, and Raaler Lode dump.

Sand and gravel, stone, feldspar, mica, and gem stones—comprising the nonmetals group—were valued at $59,000 in 1956. In terms of value, sand and gravel produced by construction and maintenance crews of the State highway department and Harrison & Atchison Co. as its contractor ranked first, followed by dimension granite quarried by the Pikes Peak Granite Co. E. S. Robinson shipped 950 tons of potash feldspar from the Black Cloud, Little Eagle, Little Annie, and

Digitized by Google

Snowflake mines near Divide, and E. M. Erickson and F. B. Young sold 18 tons of scrap mica.

**Washington.**—Petroleum plus a small quantity of sand and gravel was produced in 1956.

Petroleum production gained significantly in 1956, the total output being 7.2 million barrels compared with 5.8 million in 1955. The county was also the most active in drilling, with 172 wildcat and 143 development wells completed; of these, 7 wildcat and 71 development wells were successful.

**Weld.**—The county was a source of petroleum, coal, and sand and gravel, and the output of all three commodities was greater than in 1955. No production of stone was reported.

Petroleum output came from 23 fields, of which the Black Hollow, Jackpot, Battle Canyon, Pierce, West Buckingham, and May were the most important. The May field was a 1956 discovery.

Seven coal mines were active, and average employment was 301 men. The Eagle and Washington mines, operated by the Imperial Coal Co. and the Clayton Coal Co., respectively, were the most productive. In April the Shamrock mine was closed by the Shamrock Coal Co. The mine was opened in 1905 and had had a total production of 2.2 million tons.

Sand and gravel production in Weld County during 1956 reached 519,000 tons, compared with 308,000 tons in 1955. Increased activity by the Colorado Department of Highways through private contractors was responsible for the gain. The private contractors who quarried sand and gravel in conjunction with road projects were Blanchard Construction Co., Colorado Constructors, Inc., Herren & Strong, L. J. Hesser, Carl V. Hill, and Siegrist Construction Co. Output was also reported by construction crews of the county highway department and John Braddy as contractor for the Greeley city engineer.

Digitized by Google

Digitized by Google

# The Mineral Industry of Connecticut

By Robert D. Thomson[1] and Mary E. Otte[2]

THE VALUE of mineral production in Connecticut was a record $11.9 million, a 14-percent increase over the $10.4 million for 1955. Tonnages and values of all mineral commodities increased over 1955, except for feldspar, mica, and columbium-tantalum. Stone ranked first in value, followed by sand and gravel, lime, and clays, in order of decreasing importance. As in 1955, companies were actively engaged in producing mineral commodities from all 8 counties. Hartford County led, with $4.1 million for mineral production. The mineral industry in New Haven County totaled $4 million, and Litchfield County production was over $1 million.

In addition to mineral producers, there was an active mineral processing and fabricating industry. Twelve iron and steel plants produced such items as steel wire, forgings, castings, hot and cold strip steel, and spring steel. Northeastern Steel Company operated 3 open-hearth and 2 electric furnaces at Bridgeport—a total annual steel capacity of 303,200 net tons. Twenty-four nonferrous-metal rolling mills were in production in 1956. These companies consumed aluminum, antimony, copper, lead, nickel, tin, and zinc for producing nonferrous plates, sheets, rolls, strips, wire and wire products, and tubing. Ten of the 24

**TABLE 1.—Mineral production in Connecticut, 1955–56[1]**

| Minerals | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Beryllium concentrate.....gross weight | 5 | $3,185 | (2) | (2) |
| Clays | 324,832 | 314,577 | 337,984 | $390,295 |
| Lime | 34,917 | 503,253 | 39,748 | 609,202 |
| Mica, scrap, and flake | 2 | 84 | | |
| Mica sheet.....pounds | 2,083 | 12,904 | 310 | 2,064 |
| Peat | (2) | (2) | 22,315 | 152,450 |
| Sand and gravel | 4,345,068 | 4,079,661 | 4,368,727 | 4,100,666 |
| Stone | [3] 3,641,992 | [3] 5,451,550 | [3] 4,427,987 | [3] 6,589,727 |
| Value of items that cannot be disclosed: Columbium-tantalum (1955), feldspar, stone (crushed granite (1955) and dimension limestone), and values indicated by footnote 2 | | 123,084 | | 123,409 |
| Total Connecticut[4] | | 10,428,000 | | 11,876,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Excludes certain stones, value for which is included with items that cannot be disclosed.
[4] The total has been adjusted to eliminate duplicating the value of stone.

[1] Acting Chief, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V., Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

companies produced brass products. Aluminum smelters were at Balsford, Bridgeport, Hamden, and New Haven; 2 of the 5 plants also had zinc-smelting facilities, and 1 plant was also designated as a smelter of magnesium. Two other plants—at East Berlin and at Waterbury—smelted zinc.

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Clays.**—Output of clays increased 4 percent in tonnage and 24 percent in value over 1955. As in 1955, 8 companies were active during the year—6 in Hartford County and 1 each in Middlesex and New Haven Counties. The eight operations were captive; the miscellaneous clay was used in adjacent plants for producing heavy clay products. In addition, North Haven Brick Co., New Haven County, sold a part of its clay to other brick plants and to a lightweight-aggregate producer.

**Feldspar.**—Production of crude feldspar decreased slightly in tonnage compared with 1955, but the average value per long ton increased from $7.34 to $9.41. Two companies, Eureka Feldspar Mining & Milling Co., Inc., and the Worth Spar Co., produced feldspar from open-pit mines for processing at local company plants. The ground feldspar was sold to the pottery and soap industries. The Toll Gate Mining Co. sold crude feldspar to a consumer grinder for use in making soap.

**Lime.**—Sales of lime produced in Connecticut were 14 percent greater in volume and 21 percent in value than in 1955. The volume of sales as mason's lime was less; sales for agricultural use and for manufacturing magnesium metal and insecticides were greater. Both quick and hydrated lime was shipped to consumers in Connecticut, Massachusetts, New York, and Rhode Island. In addition, hydrated lime was shipped to New Hampshire.

**Mica.**—Sales of sheet mica decreased 85 percent in quantity and 84 percent in value, compared with 1955. No sales were reported for scrap mica produced from mines in Connecticut. All of the sheet mica was produced in Middlesex County and sold to the Government Spruce Pine (N. C.) GSA Materials Service Depot, as hand-cobbed mica.

**Sand and Gravel.**—The sand and gravel industry showed less than 1 percent increase in tonnage and value for material sold or used, compared with 1955. Larger quantities of sand for molding, paving, grinding and polishing, filter, and other uses and gravel as building material and railroad ballast were used than in 1955. Sand as building material and gravel as paving material and other uses decreased. Blast sand was the only use category for which sand was reported in 1955 and not in 1956; engine sand was reported in 1956 and not in 1955. Overall, the 30-percent increase in commercial sand as paving material and 4-percent in gravel as a building material offset the 36-percent decrease in Government-and-contractor sand and gravel production. Of the total commercial production of sand and gravel, 85 percent was washed or screened. Ninety-one percent of the com-

Digitized by Google

mercial output was transported by truck, 6 percent by waterway, and 3 percent by railroad.

The number of men employed in the commercial sand and gravel industry in 1956 totaled 299. The average number of days worked per man was 223, and the average number of hours per man per day 8.5.

**TABLE 2.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| Uses | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Molding | 1,200 | $960 | $0.80 | 1,600 | $1,280 | $0.80 |
| Building | 1,151,029 | 1,018,061 | .88 | 1,117,975 | 1,043,143 | .93 |
| Paving | 911,097 | 778,006 | .85 | 1,188,715 | 1,077,728 | .91 |
| Grinding and polishing | 5,700 | 4,560 | .80 | 7,100 | 5,680 | .80 |
| Other | 23,157 | 7,936 | .34 | (1) | (1) | |
| Gravel: | | | | | | |
| Building | 990,058 | 1,255,182 | 1.27 | 1,033,939 | 1,254,872 | 1.21 |
| Paving | 540,286 | 584,388 | 1.08 | 471,335 | 441,892 | .94 |
| Railroad ballast | 5,400 | 4,000 | .74 | 20,000 | 24,000 | 1.20 |
| Other | 242,231 | 284,965 | 1.18 | 159,694 | 112,767 | .71 |
| Undistributed [2] | 3,265 | 2,850 | .87 | 64,601 | 34,502 | .53 |
| Total commercial sand and gravel | 3,873,423 | 3,940,908 | 1.02 | 4,064,959 | 3,995,864 | .98 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: Paving | 144,990 | 20,610 | .14 | 240,993 | 81,593 | .34 |
| Gravel: | | | | | | |
| Building | 350 | 350 | 1.00 | 2,025 | 709 | .35 |
| Paving | 326,305 | 117,793 | .36 | 60,750 | 22,500 | .37 |
| Total Government-and-contractor sand and gravel | 471,645 | 138,753 | .29 | 303,768 | 104,802 | .35 |
| Grand total | 4,345,068 | 4,079,661 | .94 | 4,368,727 | 4,100,666 | .94 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[2] Includes blast sand (1955), engine sand (1956), filter sand, and values indicated by footnote 1.

**Stone.**—Stone continued to be the principal mineral industry in Connecticut, contributing 55 percent of the total State value. Output increased 22 percent in tonnage and 21 percent in value compared with 1955.

Basalt, limestone, granite, and quartz, in order of decreasing value, were mined in 1956. The basalt was crushed and sold as road material, railroad ballast, and riprap. Except for a small quantity sold as rough construction dimension stone, limestone was crushed and sold as agricultural limestone, flux, road material, whiting, and asphalt filler and for manufacturing lime. Except for a quantity of granite sold as riprap, the granite was marketed as dimension stone. Silica (quartz) was ground and used as foundry sand, filler in plaster, abrasive, and making glass.

Digitized by Google

**TABLE 3.—Stone sold or used by producers, 1955–56, by uses**

| Uses | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Dimension stone: | | | | |
| Building stone: | | | | |
| Rubble | (1) | (1) | 1,642 | $14,559 |
| Rough architectural | (1) | (1) | 42 | 1,117 |
| Rough monumental | | | 366 | 38,716 |
| Dressed construction | (1) | (1) | 1,858 | 59,596 |
| Dressed architectural | | | 323 | 7,774 |
| Curbing and flagging | 378 | $14,517 | 434 | 12,135 |
| Undistributed | [2] 3,954 | 119,243 | | |
| Total dimension stone (quantities approximate in short tons) | 4,332 | 133,760 | 4,665 | 133,897 |
| Crushed and broken stone: | | | | |
| Agricultural | 60,053 | 238,270 | (1) | (1) |
| Riprap | (1) | (1) | 60,777 | 83,464 |
| Concrete, roadstone, railroad ballast | [3] 3,356,808 | [3] 4,462,371 | [3] 4,181,379 | [3] 5,693,864 |
| Quartz (ground) | 24,500 | 178,880 | 15,500 | 112,750 |
| Undistributed [4] | 196,299 | 438,269 | 165,666 | 565,752 |
| Total crushed and broken stone | 3,637,660 | 5,317,790 | 4,423,322 | 6,455,830 |
| Grand total [5] | 3,641,992 | 5,451,550 | 4,427,987 | 6,589,727 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes rough construction, dressed monumental, and values indicated by footnote 1.
[3] Incomplete figure, portion not included is combined with "Undistributed."
[4] Includes flux, other crushed and broken stone, portion of concrete, roadstone, and values indicated by footnote 1.
[5] To avoid disclosing confidential information, total is incomplete and excludes crushed granite (1955), and dimension limestone.

## METALS

**Beryllium.**—Production of beryl from the pegmatite areas in Connecticut increased in both tonnage and value compared with 1955. As in 1955, all the beryl was purchased by GSA for its Franklin (N. H.) Depot. The BeO content of the ore ranged from 10.36 to 12.28 percent.

**Columbium-Tantalum.**—No sales of columbite-tantalite from Connecticut mines were reported in 1956. In 1955 mines were worked in Middlesex and New Haven Counties.

## MINERAL FUELS

**Peat.**—Peat production in Connecticut in 1956 followed the national trend and increased to 22,000 short tons. The average value per ton for peat was $6.83. The peat was recovered from bogs in Hartford, Middlesex, and Tolland Counties. Although classified statistically with fuels, peat was used principally as a soil conditioner.

Digitized by Google

**TABLE 4.—Value of mineral production in Connecticut, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Fairfield | $876,629 | (1) | Sand and gravel, stone. |
| Hartford | 3,214,871 | $4,130,208 | Stone, sand and gravel, clays, peat. |
| Litchfield | 1,318,332 | 1,535,256 | Stone, lime, sand and gravel, beryl. |
| Middlesex | 280,801 | 470,853 | Sand and gravel, clays, feldspar, peat, mica. |
| New Haven | 3,917,616 | 4,009,427 | Stone, sand and gravel, clays, beryl. |
| New London | (1) | 358,212 | Stone, sand and gravel. |
| Tolland | (1) | (1) | Peat. |
| Windham | (1) | 461,300 | Sand and gravel, stone. |
| Undistributed | 819,731 | 910,553 | |
| Total | 10,428,000 | 11,876,000 | |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

## REVIEW BY COUNTIES

**Fairfield.**—Production of sand and gravel was reported by seven companies in Fairfield County. Peter B. German, Inc., Fairfield, and The Grasso Construction Co., Inc., Bridgeport, produced sand and gravel for building and paving purposes. The Grasso Construction Co. also sold a quantity of sand under contract to local Government agencies for sanding oily and icy roads. Senior Sand & Gravel Co., Inc., Bethel, produced building sand and gravel and paving sand; John Lomazzo & Sons Corp., Weston, produced and sold paving sand and gravel and building gravel. Ralph L. Vick Co. near New Canaan produced bank-run gravel and sold part of the production under contract to a local Government agency. L. DeLuca's Sons near Greenwich produced road gravel from dredging at a small lake in Fairfield County. The estate of Bernard J. Dolan, Bethel, produced building sand and gravel from a pit and fixed plant.

The only operator of a limestone quarry and preparation plant was the Connecticut Agstone Co., Danbury. Output consisted of dimension stone for use in rough construction and crushed stone as flux and for construction and agricultural purposes.

**Hartford.**—Hartford County led the State in producing minerals, providing 35 percent of the total value of mineral output. This county also led in producing sand and gravel. Six companies produced basalt during the year. The Edward Balf Co., Newington, and Sherman Sand & Stone Co., Plainville, quarried and sold crushed basalt for use as concrete aggregate and road material. Angelo Tomasso, Inc. (New Britain), Arborio & Sons, Inc. (Farmington), and Materials Service, Inc. (East Granby), quarried and crushed basalt for use as riprap, concrete aggregate, and road material. A part of Angelo Tomasso, Inc., production was used for local government projects. The New Haven Trap Rock Co. produced crushed basalt at the Plainville quarry for use as riprap, concrete aggregate, road material, and railroad ballast.

Digitized by Google

Twelve companies reported production of sand and gravel for use mainly as structural, paving, and filter material. Smaller quantities of sand and gravel were used as molding sand, as grinding and polishing sand, and for other uses. The leading producers were Dunning Sand & Gravel Co., Inc., Farmington Sand & Gravel Co., and Sherman Sand & Stone Co., all at Farmington; Russak Bros., Inc., Plainville; Manchester Sand & Gravel Co., Manchester; Materials Service, Inc., East Granby; Helming Bros., Bristol; The Certified Sand Co., Rocky Hill; Burlington Sand & Gravel, near Collinsville; and The Avon Construction Co., Avon. Connecticut State Highway Department (Hartford), the town of South Windsor, and the superintendent of public works, Bristol, produced paving sand and gravel and structural gravel for local consumption.

Six operators of open-pit clay mines produced and used miscellaneous clay for manufacturing building brick. The six active companies were Clark Brick Co., South Windsor; Donnely Brick Co., Kensington; The Stiles & Reynolds Brick Co. and The Eastern Brick Co., both at Berlin; Kelsey Ferguson Brick Co., Suffield; and Edward W. Mack & Son, Windsor.

Hartford County was the leading peat-producing county in the State; production increased over 1955. Woodrow Clifford, the only producer of peat, recovered humus peat from a bog near Manchester.

**Litchfield.**—Building Materials, Inc., merged with Woodbury Trap Rock Co., Inc., and operated a quarry and crushing plant at Woodbury. Crushed basalt was sold for use as concrete aggregate and road material. Producers of crushed limestone for use as flux, agricultural limestone, whiting, and asphalt filler were: The Conklin Limestone Co., Inc., and New England Lime Co., both of Canaan; and United States Gypsum Co., Falls Village. United States Gypsum Co. produced and marketed crushed dolomite as flux, whiting, and filler for stucco and for agricultural use.

Quick and hydrated lime produced at the New England Lime Co., Canaan plant, was marketed for use as building, agricultural, chemical, and industrial lime.

Sand and gravel recovered from pits in Litchfield County was used principally as structural and paving material. The five active producers were State Line Sand & Gravel, Inc., Canaan; Building Materials, Inc., Torrington; The Lime Rock Sand & Gravel Co., Salisbury; Carlson Construction Co., Inc., New Milford; and Benvenuti & Favali Construction Co., Inc., Torrington.

Production of beryl consisted of a small quantity mined by Howard J. Hewitt at the Hewitt mine, New Milford, and sold to GSA Franklin (N. H.) Depot.

Nelco Metals, Inc., continued to operate the 5,000-ton Government-owned silicothermic plant at Canaan. Both calcium and high-purity magnesium were produced.

**Middlesex.**—Sand and gravel recovered from a bank by Richard Lindemark was screened and used at the company ready-mixed-concrete plant at Portland. Also, a quantity of gravel was sold as building material. Butler Sand Service, Portland, produced and processed sand for building use; Sebastian Ortisi, also of Portland, processed sand and gravel for building use. Shore Line Washed Sand & Stone Co., Inc., Killingworth, produced building and paving sand

Digitized by Google

and gravel at a pit and fixed plant. This company also sold road sand under contract to local government agencies. Bugg & Heser, Clinton, produced building and paving sand and paving gravel. Stanley Wollock produced building and paving sand and gravel at a pit and fixed plant at Essex.

Miscellaneous clay was produced from an open pit at Middletown and used for manufacturing building brick by The Michael Kane Brick Co.

Production of feldspar in Middlesex County was reported by three companies. The Worth Spar Co. recovered potash-type feldspar from an open-pit mine near Cobalt and ground the crude ore at a local company plant. The ground feldspar was sold for use in making soap and abrasives. Eureka Feldspar Mining & Milling Co., Inc., produced mixed-potash-soda-type feldspar at the Hale quarry near Portland and ground the crude ore at the nearby company-owned grinding plant, marketing the ground feldspar to the pottery industry. Toll Gate Mining Co. mined potash and mixed-potash-soda-type feldspar and a small quantity of hand-cobbed mica at the Toll Gate open-pit mine near Middletown. The crude feldspar was sold to a consumer grinder. The mica was shipped to the GSA, Spruce Pine (N. C.) Depot.

J. Werden Clark, the only producer of peat in Middlesex County, produced humus peat from a bog near Old Saybrook.

**New Haven.**—New Haven County continued to be the leading stone producer in the State. Crushed basalt was sold or used as concrete aggregate, road material, railroad ballast, and riprap, in order of decreasing importance. Producers were C. W. Blakeslee & Sons, Inc., Hamden; A. N. Farnham, Inc., Foxon Trap Rock Co., Inc., and The New Haven Trap Rock Co. (North Branford and Wallingford quarries), all near New Haven; and The York Hill Trap Rock Quarry Co., Meriden. Dimension granite was produced and sold as dressed architectural stone by Castellucci & Sons, Inc., Branford, under the trade name "Stony Creek."

Thirteen companies recovered sand and gravel from pits, banks, and dredges for sale or use predominantly as structural and paving material. Some of the sand and gravel also was sold or used for government projects. The 10 leading producers were A. N. Farnham, Inc., The Elm City Construction Co., the estate of Stillman H. Rice, all at New Haven; Beard Sand & Gravel Co., Inc., and The Iron Ledge Co., both at Milford; D. J. Carten Sand & Gravel Co., Devon; Meridan Washed Sand & Stone Co., Inc., Wallingford; Tony Calabro Sons, Inc., and Colonial Sand-Gravel Co., both at Waterbury; and The Seymour Sand & Stone Co., Seymour.

North Haven Brick Co. operated an open-pit mine near Hamden, marketing the miscellaneous clay for manufacturing building brick and lightweight aggregate. The company also used some of the miscellaneous clay for producing building brick at a nearby company plant.

Burritt R. Curtis mined beryl at the Southford quarry, Southbury, and sold his entire output to the GSA Franklin (N. H.) Depot.

Connecticut Adamant Plaster Co. imported gypsum from Chever, Nova Scotia, to its New Haven plant. Crude gypsum was sold for agricultural use and calcined gypsum for building purposes.

Digitized by Google

**New London.**—Lantern Hill Silica Co. operated a quarry and plant at North Stonington, producing ground silica (quartz) for use as an abrasive, foundry sand, and plaster sand and in manufacturing glass. Dimension granite used as rough monumental stones was quarried by Golden Pink Granite Quarry Co. and E. Locarno & Sons, Niantic. The Millstone Granite Quarry, Inc., Waterford, quarried and sold dimension granite for use as rubble, rough architectural stone, and monumental stone and crushed granite as riprap.

John J. Doyle Sand & Gravel Co., Inc., produced washed sand and gravel at a pit and fixed plant at Montville for building use and for manufacturing ready-mixed concrete. A quantity of the sand and gravel was sold for government projects. Southern New England Contractors Supply Co. produced building and paving sand at a pit and fixed plant near New London. Lorentz & Howard, Inc., produced paving sand and gravel at a portable plant at Fitchville. Lappie Construction Co., Norwich, produced unwashed sand and gravel for paving material.

**Tolland.**—Bonair Peat Co., Inc., the only mineral producer in Tolland County in 1956, recovered humus peat from a bog near Ellington.

**Windham.**—Dunning Sand & Stone Co., Wauregan, reported producing sand and gravel for building and paving use and gravel as railroad ballast. R. A. Rawson Sand & Gravel, Putnam, produced building sand and paving sand and gravel. Rawson also sold a quantity of sand and gravel to a local government agency.

Dimension granite sold for use as rough building stone, curbing stone, and capstone, was quarried by R. B. Marriott & Sons at Oneco

Digitized by Google

# The Mineral Industry of Delaware

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Delaware Geological Survey.

By Robert D. Thomson [1] and Mary E. Otte [2]

THE VALUE of mineral production in Delaware in 1956 was $1.2 million, a 26-percent decrease below the total ($1.7 million) recorded in 1955. The decline in value of output was the first decrease since 1953 and resulted mainly from a drop in the volume of output of Government-and-contractor sand and gravel. Slight gains in total value were reported for miscellaneous clay and granite. One or more mineral commodities were produced in each of the three counties in the State; New Castle County led.

In addition to the mineral producers, companies were actually engaged in processing minerals in 1956. The Colorado Fuel & Iron Corp., Claymont, operated 2 open-hearth furnaces, 2 sheared-plate mills, and a pipe mill. Annual steel capacity for this company totaled 499,500 net tons. The American Manganese Steel Division of American Brake Shoe Co. operated 1 electric furnace with an annual capacity of 5,400 tons, producing austenitic manganese castings at its New Castle plant. North American Smelting Co. at Wilmington operated 4 rotary furnaces; 3 sweat, reverberatory and crucible furnaces; and 9 kettles. This plant produced brass and aluminum ingots, solder, type metals, aluminum shot, and die-cast metal.

**TABLE 1.—Mineral production of Delaware, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | (2) | (2) | (2) | (2) |
| Sand and gravel | 2,297,074 | $1,407,196 | 1,159,544 | $966,508 |
| Stone | 78,791 | 227,450 | 82,503 | 232,503 |
| Value of items that cannot be disclosed: Nonmetals and values indicated by footnote 2 | | 22,872 | | 32,725 |
| Total Delaware | | 1,658,000 | | 1,232,000 |

[1] Production as measured by mine shipments and mine sales (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.

[1] Acting chief, Division of Mineral Industries, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Clays.**—Demand for Delaware miscellaneous clay was less than in 1955 due mainly to a decline in residential building. Nevertheless, the average value per ton increased from $0.51 in 1955 to $0.90 in 1956. All the clay was produced from open-pit mines for use in making building and face brick, 2 of the 3 mines were captive.

**Sand and Gravel.**—Sand and gravel production continued to be the principal mineral industry in Delaware, although output in 1956 decreased 50 percent in tonnage and 31 percent in value compared with 1955. The decreased activity was due mainly to declining demand for paving materials for Government projects. Commercial demand was slightly greater than in 1955. Sand was marketed for commercial use as structural and paving material, engine sand, and railroad ballast. Gravel was sold for structural, paving, and other uses. Of the total commercial production of sand and gravel, 52 percent was washed or screened, and 56 percent of the output was transported by truck.

**Stone.**—Production of stone increased slightly compared with 1955; the average value of stone about equaled that in 1955. The stone was produced from a quarry and crushed and marketed as "Blue Granite" for use as roadstone and stone sand (aggregate for concrete or bituminous mixtures)

## REVIEW BY COUNTIES

**Kent.**—St. Jones River Gravel Co. produced washed sand and gravel for paving use at a pit and fixed plant near Dover. Clough & Caulk Sand & Gravel produced and processed washed building sand and gravel and a quantity of unwashed gravel from a pit and fixed plant near Dover. Fisher M. Carpenter, north of Milford in Kent County, produced bank-run gravel for miscellaneous uses. A quantity of paving sand and gravel was produced under contract for the Corps of Engineers, United States Army.

Miscellaneous clay was produced by J. H. Wilkerson & Son from an open pit north of Milford in Kent County for use in manufacturing building brick.

**New Castle.**—Mineral production in New Castle County in 1956 continued to be the largest in the State, supplying 70 percent of the total value. Delaware Sand & Gravel Co. processed sand and gravel for building purposes and a quantity of unwashed sand for railroad ballast at a dredge and fixed plant near New Castle. Petrillo Bros., Inc., produced washed sand and gravel for building purposes and a quantity of unwashed bank-run gravel for fill from a bank near Minquadale. John C. Green, Jr., Middletown, produced gravel for miscellaneous uses. The Parkway Gravel, Inc., pits at Minquadale and Hares Corner produced unwashed gravel for paving material. Whittington's Sand & Gravel Co. produced and prepared building sand and gravel and unwashed paving gravel from a pit at Bear.

Granite, crushed and sold under the trade name of "Blue Granite," was produced by Petrillo Bros., Inc., from the Shellpot quarry and

Digitized by Google

crusher near Wilmington. The stone was used as roadstone and stone sand.

J. R. Simeone produced miscellaneous clay from an open pit at Wilmington and sold the clay for manufacturing building brick. Delaware Brick Co., New Castle, produced miscellaneous clay from an open pit and used the clay for manufacturing building brick.

**Sussex.**—W. Paynter Sharp produced select and common gravel for use as paving and fill from a bar pit at Milton. Melvin Joseph Construction Co., Georgetown, produced gravel for road construction. Lewes Sand Co. produced engine sand at a pit and fixed plant at Lewes. Sand was recovered from a pit and processed at a portable plant by Henry G. Graves & Sons, Lewes, for use as paving and road material.

465877—58——21

Digitized by Google

Digitized by Google

# The Mineral Industry of Florida

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior and the Geological Survey of Florida.

By James L. Vallely [1] and James L. Calver [2]

FLORIDA'S record-breaking mineral production reached a new high in 1956, with a total value of $140.5 million—29 percent or $31.5 million above 1955. Output of phosphate rock led; tonnage increased 35 percent and value 38 percent over 1955 and 13 and 15 percent in tonnage and value, respectively, over the previous record year, 1954. New records were set in producing cement, titanium concentrates, sand and gravel, stone and zirconium concentrate. Petroleum production remained comparatively unchanged; peat, abrasive garnet, and rare-earth metals declined from 1955.

**TABLE 1.—Mineral production in Florida, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 412,766 | $4,815,855 | 432,369 | $5,826,468 |
| Gem stones | | | [3] | 100 |
| Lime | [3] | [3] | 39,542 | 490,086 |
| Natural gas, million cubic feet | 36 | 4,000 | 35 | 3,000 |
| Peat | 61,098 | 231,829 | 58,496 | 203,034 |
| Petroleum, thousand 42-gallon barrels | 495 | [3] | 479 | [3] |
| Phosphate rock, long tons | 8,747,282 | 53,640,301 | 11,822,145 | 74,289,758 |
| Sand and gravel | 5,065,503 | 4,349,148 | 5,814,686 | 5,033,475 |
| Stone | [4] 17,027,967 | [4] 22,966,008 | 18,778,632 | 25,183,165 |
| Titanium concentrates: | | | | |
| Ilmenite | [3] | [3] | 283,956 | 6,651,162 |
| Rutile | 9,182 | 1,122,000 | | |
| Zirconium concentrate | 28,913 | 1,425,641 | 43,794 | 2,159,540 |
| Value of items that cannot be disclosed: Cement, abrasive garnet, rare-earth-metals concentrates, stone (dimensions limestone, 1955), and values indicated by footnote [5] | | 22,787,056 | | 21,801,661 |
| Total Florida [6] | | 108,957,000 | | 140,490,000 |

[1] Production as measured by mine or plant shipments (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Incomplete total, excludes dimension limestone.
[5] The total has been adjusted to eliminate duplicating the value of clays and stone.

[1] Commodity-Industry Analyst, Knoxville Field Office, Region V, Bureau of Mines, Knoxville, Tenn.
[2] Geologist, Florida Geological Survey, Tallahassee, Fla.



Digitized by Google

**TABLE 2.—Average unit value of mineral commodities in Florida, 1947–51 (average) and 1952–56**

| Commodity | | 1947-51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|
| Cement: | | | | | | | |
| Masonry | | (1) | (1) | (1) | (1) | $3.78 | $4.03 |
| Portland | 376-pound barrel | $2.55 | $2.76 | $2.87 | $2.89 | 2.96 | 3.21 |
| Clays: | | | | | | | |
| Fuller's earth | short ton | 17.56 | 17.37 | 18.84 | 19.82 | 21.46 | 22.37 |
| Kaolin | do | 21.37 | 24.55 | 23.92 | 24.49 | 23.09 | 25.24 |
| Miscellaneous | do | .77 | 1.00 | 1.00 | .78 | 1.03 | 1.05 |
| Garnet | do | 38.07 | 46.44 | 46.49 | 30.00 | 60.69 | 25.00 |
| Lime | do | 13.21 | 12.93 | 12.57 | 11.97 | 12.03 | 12.39 |
| Natural gas | thousand cubic feet | .04 | .07 | .06 | .08 | .11 | .28 |
| Peat | short ton | 4.79 | 6.50 | 6.70 | 4.49 | 3.79 | 3.47 |
| Phosphate rock | long ton | 5.59 | 5.88 | 6.06 | 6.18 | 6.13 | 6.28 |
| Sand and gravel: | | | | | | | |
| Gravel | short ton | 1.21 | 1.34 | 1.27 | 1.50 | 1.51 | 1.43 |
| Sand | do | .84 | .75 | .82 | .71 | .76 | .77 |
| Stone: | | | | | | | |
| Limestone (crushed) | do | 1.21 | 1.22 | 1.20 | 1.25 | 1.31 | 1.30 |
| Shell | do | | | | | 2.28 | 2.03 |
| Titanium: | | | | | | | |
| Ilmenite | do | 13.94 | 16.35 | 15.37 | 15.36 | 18.97 | (2) |
| Rutile | do | 50.60 | 103.77 | 108.54 | 119.05 | 122.20 | (2) |
| Zircon | do | 47.54 | 38.57 | 37.38 | 45.66 | 49.31 | 49.31 |

[1] Data not available.
[2] Figure withheld to avoid disclosing individual company confidential data.

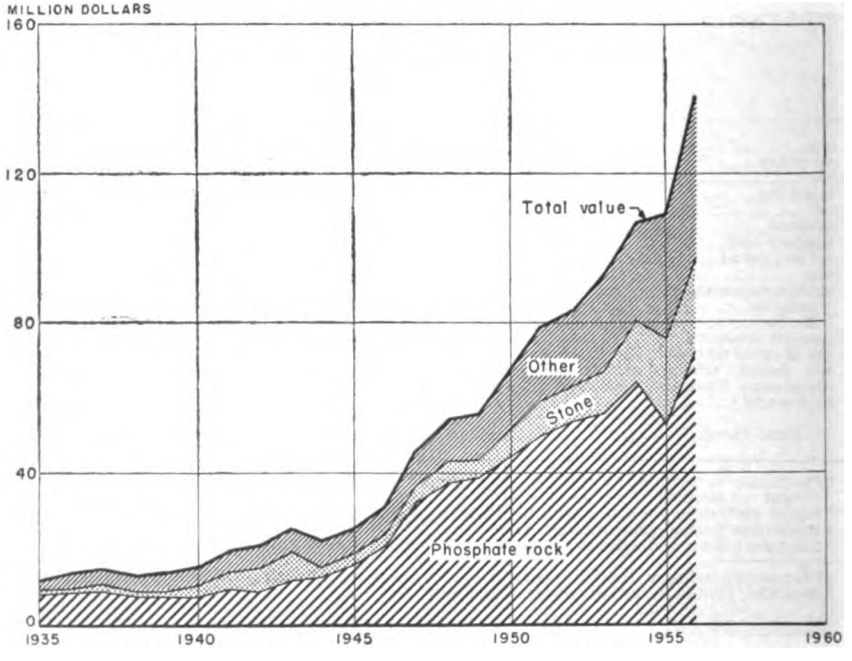



FIGURE 1.—Value of phosphate rock, stone, and total value of mineral production in Florida, 1935–56.

Digitized by Google

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Cement.**—The cement industry in Florida continued to expand; production of masonry and portland cements reached an alltime high. Total cement production increased 10 percent in tonnage and 19 percent in value.

General Portland Cement Co. operated a cement plant at Tampa and alnnounced plans for a new plant costing $15 million to be built 19 mi es west of Miami. Annual capacity will be 2.5 million barrels. Lehigh Portland Cement Co. operated its cement plant completed in 1952 at Bunnell and planned to build another plant several miles west of .Miami. Capacity will be 2 million barrels annually.

**Clays** —Total value of all clays was 21 percent higher than in 1955, although tonnage increased only 5 percent. Fuller's earth increased 20 percent in tonnage and 25 percent in value; kaolin and miscellaneous clay each dropped 8 percent in tonnage. Miscellaneous clay was 7 percent lower in value, but kaolin value was virtually unchanged from 1955.

*Fuller's Earth.*—Magnet Cove Barium Corp. began producing fuller's earth for insecticide carriers from a new mine and plant near Havana. The Floridin Co., Inc., and Minerals & Chemicals Corp. of America both increased their output. The three companies produced in Gadsden County.

*Kaolin.*—Edgar Plastic Kaolin Co. and United Clay Mines Corp. in Putnam County produced kaolin.

*Miscellaneous Clay.*—Only two producers were active in 1956. General Portland Cement Co. mined common clay for use in manufacturing cement; Apalachee Correctional Institute mined clay for brick manufacture.

**Garnet (Abrasive).**—Garnet production fell to less than 50 percent of 1955. Florida Ore Processing Corp., the only producer, discontinued recovering the mineral in July 1956. Garnet was a byproduct in the production of titanium concentrates.

**Gypsum.**—Imported crude gypsum was calcined and used in manufacturing building products by the United States Gypsum Co.

**Lime.**—Production of lime in 1956 was 39,500 tons valued at $490,000. Producers were city of Miami and Dixie Lime Products Co. at Kendrick.

**Perlite.**—Crude perlite from out of State was expanded into a lightweight material for use in building and construction. Expanding plants were operated by Perlite, Inc., Hialeah; Tennessee Products & Chemical Corp., Jacksonville, and Airlite Processing Corp., Vero Beach.

**Phosphate Rock.**—The marketable production of phosphate rock jumped from 8.8 million tons valued at $53.6 million in 1955 to 11.8 million tons and $74.3 million, an increase of 35 percent in tonnage and 38 percent in value over 1955 and 13 and 15 percent in tonnage and value, respectively, above 1954—the previous peak year. Land-pebble phosphate, comprising more than 98 percent of total production, supplied the gain; the small increase in output of hard-rock phosphate was more than offset by the decrease in soft rock. Phosphate rock sold or used by producers was 10.5 million tons valued at

Digitized by Google

$65.6 million—an increase of 10 percent in tonnage and 11 percent in value over 1955.

Land-pebble phosphate was produced by 8 companies from 16 mines in Polk and Hillsborough Counties. Armour & Co. Bartow mine, inactive for many years, resumed operations at the beginning of 1956. International Minerals & Chemical Co. closed its Peace Valley mine about July 1 owing to a greater than seasonal slump in sales of fertilizer and in manufacture of phosphoric acid. American Cyanamid Co. and others also curtailed production in the second half of the year. However, total land-pebble production for the year exceeded that in 1955 by 36 and 39 percent in tonnage and value, respectively, and 14 and 15 percent above the peak year in 1954.

Hard-rock phosphate was up 5 percent in tonnage and 10 percent in value above 1955. Kibler-Camp Phosphate Enterprises, operating in Citrus County, was the only producer. All hard-rock production was used for elemental phosphorus.

**TABLE 3.—Marketable production of phosphate rock, 1948–51 (average) and 1952–56**

| Year | Hard rock | | Soft rock | | Land pebble | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Long tons | Value | Long tons | Value | Long tons | Value | Long tons | Value |
| 1948–51 (average) | 51,332 | $390,076 | 79,258 | $380,227 | 7,535,352 | $43,097,923 | 7,665,942 | $43,868,226 |
| 1952 | 85,900 | 662,289 | 83,001 | 491,775 | 9,036,237 | 52,931,460 | 9,205,138 | 54,085,524 |
| 1953 | 68,200 | 537,416 | 76,781 | 474,248 | 9,186,021 | 55,513,037 | 9,331,002 | 56,524,701 |
| 1954 | 78,990 | 622,440 | 93,956 | 575,537 | 10,264,251 | 63,301,900 | 10,437,197 | 64,499,877 |
| 1955 | 91,200 | 733,800 | 69,788 | 452,301 | 8,586,294 | 52,454,200 | 8,747,282 | 53,640,301 |
| 1956 | 95,600 | 808,700 | 59,022 | 378,058 | 11,667,523 | 73,103,000 | 11,822,145 | 74,289,758 |

**TABLE 4.—Phosphate rock sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Long tons | Value [1] | Long tons | Value [1] |
| Ordinary superphosphate | 4,618,100 | $28,847,854 | 5,024,144 | $32,674,165 |
| Triple superphosphate [2] | 1,598,910 | 9,703,638 | 1,534,209 | 9,663,519 |
| Elemental phosphorus, ferrophosphorus, phosphoric acid | 604,911 | 3,556,235 | 700,871 | 4,248,603 |
| Direct application to soil | 661,702 | 4,136,626 | 637,400 | 4,146,704 |
| Stock and poultry feed | 189,309 | 1,190,134 | 228,745 | 1,485,493 |
| Fertilizer filler | | | | |
| Other uses [3] | 13,056 | 80,344 | 7,740 | 50,387 |
| Exports [4] | 1,879,157 | 11,664,277 | 2,394,661 | 13,333,426 |
| Total | 9,565,145 | 59,179,108 | 10,527,770 | 65,602,297 |

[1] Estimated from company reports.
[2] Rock for phosphoric acid (wet process) included with triple superphosphate.
[3] Includes phosphate rock used in calcium metaphosphate, fused tricalcium phosphate, nitraphosphate, pig-iron blast furnaces, parting compounds, research, defluorinated phosphate rock, refractories, and other applications.
[4] As reported by producers.

Soft-rock production declined 15 percent in tonnage and 16 percent in value below 1955. Output came from 5 producers in Citrus County and from 1 producer in each of Columbia and Gilchrist Counties. Soft-rock phosphate was used for stock and poultry feeds and direct application to the soil.

**Sand and Gravel.**—Sand and gravel production reached an alltime

Digitized by Google

high, totaling 5.8 million tons valued at $5 million dollars—an increase of 15 percent in tonnage and 16 percent in value. Sand production was up 13 and 14 percent in tonnage and value, respectively, and gravel was 28 and 21 percent higher. Thirty-four operators were active in 16 counties; all produced sand. Four of these companies also produced gravel in Dade, Escambia, Gadsden, and Putnam Counties. Sand and gravel was used principally for building and paving; comparatively small tonnages were classified as blast, engine, filter, and molding sands, fertilizer filler, roofing granules, and railroad ballast.

**TABLE 5.—Sand and gravel sold or used by producers, 1951–56**

| Year | Sand | | Gravel | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1951 | 2,986,862 | $2,512,282 | 1,431,711 | $1,788,400 | 4,418,573 | $4,300,682 |
| 1952 | (1) | (1) | (1) | (1) | 4,154,613 | 3,848,077 |
| 1953 | 3,386,329 | 2,760,410 | 345,103 | 438,958 | 3,731,432 | 3,199,368 |
| 1954 | 3,202,364 | 2,260,825 | 266,478 | 400,327 | 3,468,842 | 2,661,152 |
| 1955 | (1) | (1) | (1) | (1) | 5,065,503 | 4,349,148 |
| 1956 | (1) | (1) | (1) | (1) | 5,814,686 | 5,033,475 |

[1] Figure withheld to avoid disclosing individual company confidential data.

**TABLE 6.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Paving | 1,009,891 | $938,474 | 1,029,795 | $902,312 |
| Engine sand | 9,294 | 5,025 | 10,825 | 5,600 |
| Railroad ballast | 17,244 | 17,244 | 23,314 | 20,257 |
| Other [1] | 4,029,074 | 3,388,405 | 4,750,752 | 4,105,306 |
| Total | 5,065,503 | 4,349,148 | 5,814,686 | 5,033,475 |

[1] Includes structural sand and gravel, molding sand, blast sand, filter sand, other sand and gravel.

**Staurolite.**—Staurolite was recovered as a byproduct in concentrating titanium minerals and was marketed principally as an iron and aluminum additive in manufacturing portland cement; a small amount was used for sandblasting monumental stone.

**Stone.**—Total stone production, including shell and limestone used for cement, reached an alltime high of 18.8 million tons valued at $25.1 million, 10 percent above 1955 in both tonnage and value.

Commercial crushed limestone was produced from 69 quarries in 18 counties by 55 companies. Broward and Dade Counties each had 14 active quarries; Levy had 7 quarries; and Marion, 6 quarries. Dimension limestone was produced in 4 counties by 5 companies and shell by 4 companies in 3 counties.

Dimension limestone was quarried principally for rough and dressed architectural uses. Small tonnages were sold for rubble, curbing, and flagging. Shell was produced principally for concrete, road metal, and agricultural use; a small tonnage was used for poultry grit.

Palm Beach County Highway Department was the only Government-and-contractor producer in 1956.

Digitized by Google

**TABLE 7.—Crushed limestone sold or used by producers, 1947–51 (average) and 1952–56.**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) [1] | 5,044,077 | $6,112,239 | 1954 | 14,225,356 | $16,832,066 |
| 1952 [1] | 7,836,124 | 9,572,575 | 1955 | 16,303,625 | 21,312,339 |
| 1953 [1] | 9,428,959 | 11,309,421 | 1956 | [2] 18,773,880 | [2] 25,029,872 |

[1] Excludes stone used for cement and lime manufacture.
[2] Includes shell.

**TABLE 8.—Crushed limestone sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Concrete and roadstone | 13,394,698 | $16,732,609 | [1] 14,308,602 | [1] $19,373,986 |
| Agriculture | 392,653 | 1,324,136 | 594,198 | 1,721,388 |
| Railroad ballast | 65,745 | 105,516 | 35,030 | 34,868 |
| Riprap | 100,000 | 125,000 | | |
| Other | 2,350,529 | 3,025,078 | [1] 3,836,050 | [1] 3,899,630 |
| Total | 16,303,625 | 21,312,339 | 18,773,880 | 25,029,872 |

[1] Includes shell.

## METALS

**Rare-Earth Metals.**—Monazite was recovered by Humphreys Gold Corp. at the Jacksonville plant as a byproduct in concentrating titanium minerals. Production was considerably below that in 1955.

**Titanium.**—Ilmenite and rutile-concentrate production totaled $6.7 million in 1956. Ilmenite production increased over 40 percent in both tonnage and value above 1955, and rutile also recorded a substantial gain but considerably less than ilmenite. Humphreys Gold Corp. operated the Highland and Trail Ridge dredges and concentration plants in Clay County for E. I. du Pont de Nemours & Co., Inc., and produced a mixed-titanium concentrate, ilmenite, zircon, and staurolite. Humphreys Gold Corp. also operated a dredge and processing plant for the Rutile Mining Company of Florida at Jacksonville. Both rutile and ilmenite concentrates were produced from this property. Florida Minerals Co. produced ilmenite and rutile from sands mined in Indian River County.

Several other companies continued active in exploration or development of heavy mineral sands throughout the northern part of the State. Among these were: Nuclear Magnetic Mining Co. of St. Augustine, granted a 5-year lease to dredge for titanium minerals in the Salt Run area of Anastasia State Park near St. Augustine; American Smelting and Refining Co.; Bear Creek Mining Co.; Heavy Minerals, Inc.; and Union Carbide & Carbon Corp.

**Zirconium.**—Production of zirconium concentrate was 43,800 tons valued at $2.2 million, a 52-percent increase in tonnage and value above 1955. Zircon was obtained as a byproduct in separating ilmenite and rutile from heavy sands at the Trail Ridge and Highland plants of Humphreys Gold Corp. and at the plant of Florida Minerals Co.

Digitized by Google

## FUELS

**Natural Gas.**—Production of natural gas in 1956 was 35 million cubic feet valued at $9,700, compared with 36 million cubic feet valued at $4,000 in 1955. Production came from Collier County.

**Peat.**—Peat produced for agricultural purposes declined 4 percent in tonnage and 12 percent in value below 1955. Eleven companies were active in 6 counties during the year.

**Petroleum.**—Petroleum production, all from Collier County, declined 3 percent in quantity from 1955.

## REVIEW BY COUNTIES

Mineral production was recorded from 39 of Florida's 67 counties. Limestone was produced in 18 counties, sand and gravel in 16, clays in 3, phosphate rock in 5, and titanium minerals in 3. The five leading counties, in the order of production value, were: Polk, Hillsborough, Flagler, Dade, and Clay, followed by Gadsden, Hernando, Broward, Duval, and Citrus.

**TABLE 9.—Value of mineral production in Florida, 1955–56, by counties [1] [2]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Alachua | (3) | $682,276 | Limestone. |
| Bay | $26,139 | (3) | Sand. |
| Brevard | (3) | (3) | Garnet. |
| Broward | 3,861,095 | 4,768,434 | Limestone. |
| Citrus | [4] 1,292,035 | 1,595,640 | Phosphate rock, clays, limestone. |
| Clay | (3) | (3) | Ilmenite, zircon. |
| Collier | (3) | (3) | Limestone. |
| Columbia | (3) | (3) | Phosphate rock. |
| Dade | 8,006,807 | 8,432,010 | Limestone, sand and gravel, lime. |
| Duval | (3) | (3) | Rutile, zircon, ilmenite, monazite. |
| Escambia | (3) | 282,500 | Sand and gravel. |
| Flagler | (3) | (3) | Cement. |
| Gadsden | (3) | 5,398,184 | Clays, sand and gravel. |
| Gilchrist | (3) | (3) | Phosphate rock. |
| Hernando | [4] 5,579,106 | 5,089,461 | Limestone. |
| Hillsborough | 17,591,433 | 21,506,358 | Cement, phosphate rock, shell. |
| Indian River | (3) | (3) | Rutile, zircon, sand. |
| Jackson | (3) | 7,256 | Limestone. |
| Lafayette | (3) | 190,867 | Limestone, sand. |
| Lake | (3) | (3) | Sand. |
| Leon | (3) | 58,918 | Do. |
| Levy | 958,230 | 1,218,820 | Limestone. |
| Manatee | (3) | (3) | Limestone, shell. |
| Marion | [4] 1,505,916 | 1,530,592 | Limestone, lime. |
| Monroe | 350,828 | 504,244 | Limestone. |
| Osceola | 10,000 | (3) | Sand. |
| Palm Beach | 180,899 | 180,942 | Limestone, sand. |
| Pinellas | 120,133 | 141,303 | Sand, limestone. |
| Polk | 49,134,293 | 67,927,448 | Phosphate rock, sand. |
| Putnam | (3) | 1,246,629 | Sand and gravel, kaolin. |
| St. Johns | (3) | (3) | Limestone. |
| St. Lucie | 610 | 671 | Sand. |
| Sarasota | 367,000 | 451,820 | Limestone, shell. |
| Sumter | (3) | (3) | Limestone. |
| Suwannee | (3) | (3) | Do. |
| Volusia | 26,696 | 17,858 | Sand. |
| Washington | ---------- | 26,000 | Do. |
| Undistributed [5] | [4] 19,946,241 | 18,524,596 | |
| Total Florida | 108,957,000 | 140,490,000 | |

[1] The following counties are not listed because no production was reported: Baker, Bradford, Calhoun, Charlotte, De Soto, Dixie, Franklin, Glades, Gulf, Hardee, Hendry, Highlands, Holmes, Jefferson, Lee, Liberty, Madison, Martin, Nassau, Okaloosa, Okeechobee, Pasco, Santa Rosa, Seminole, Taylor, Union, Wakulla, and Walton.

[2] Fuels are not listed by counties but are included with "Undistributed." Natural gas and petroleum were produced in Collier County, peat in Broward, Hamilton, Hillsborough, Orange, Palm Beach, and Putnam Counties.

[3] Figure withheld to avoid disclosing individual company confidential data. Included with "Undistributed."

[4] Revised figure.

[5] Includes value of mineral fuels and values indicated by footnote 3.

Digitized by Google

**Alachua.**—Crushed limestone—the only mineral produced in the county—totaled 696,000 tons. Ocala Lime Rock Co. reported initial output from the Haile quarry; Williston Shell Rock Co. operated two quarries, and the Newberry Corp. produced from the fourth quarry.

**Bay.**—Cato Sand Co. was the only mineral producer in the county.

**Brevard.**—Florida Ore Processing Corp. operated the Palm Bay concentrating plant to recover ilmenite, rutile, zircon, and garnet from sands mined in Indian River County. Florida Ore Processing Co. marketed a small tonnage of garnet.

**Broward.**—Broward County ranked second in producing crushed limestone in the State. Production totaled 3.9 million tons valued at $4.8 million—an increase of 16 percent in tonnage and 23 percent in value above 1955. Eleven companies operated 14 active quarries. Rozzo Mining Co., Fort Lauderdale, worked out and abandoned 2 of its 4 quarries at the end of 1955; and Meekins, Inc., Hollywood, began operating its new Pompano quarry. Other producers were: Deerfield Rock Corp., Hallandale Rock Corp., Road Rock, Inc., Finley P. Smith, Snyder Paving Co., Inc., and R. H. Wright & Son, Inc., all of Fort Lauderdale; Hollywood Quarries, Hollywood, and Maule Industries, Inc., Miami. Arnold Soil Co. produced peat muck near Fort Lauderdale.

**TABLE 10.—Crushed limestone sold or used by producers in Broward County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 630,013 | $539,029 | 1954 | 2,434,387 | $2,433,638 |
| 1952 | 779,255 | 786,794 | 1955 | 3,342,348 | 3,861,095 |
| 1953 | 1,893,827 | 2,024,771 | 1956 | 3,883,288 | 4,768,434 |

**Citrus.**—Soft-phosphate-rock production decreased 17 and 18 percent, respectively, in tonnage and value below 1955. Producers were Camp Phosphate Co., Kellogg Co., Soil Builders, Inc., Sun Phosphate Co., and Superior Phosphate Co.

Kibler-Camp Phosphate Enterprises was the only hardrock-phosphate producer in the State. Production was 95,600 tons valued at $809,000—a 5-percent increase in tonnage and a 10-percent rise in value over 1955.

General Portland Cement Co. opened a new limestone quarry for producing cement rock for use in its Tampa mill in manufacturing cement. It also mined clay in the same vicinity for use in the cement mill. Golden Dolomite Co. produced crushed and ground limestone for use by power companies for injection with fuel oil.

**Clay.**—Clay County ranked fifth in value of mineral output owing to production of titanium concentrates. Humphreys Gold Corp., operating the Trail Ridge and Highland mines for E. I. du Pont de Nemours & Co., Inc., produced an ilmenite concentrate, a mixed concentrate containing altered ilmenite, rutile, and leucoxene. Output far exceeded that of previous years owing to added production from the Highland plant for the first full year.

**Collier.**—Natural-gas and petroleum production continued in the Sunniland field at substantially the same rate as in 1955. Sunniland

Digitized by Google

Limerock Co. quarried and crushed limestone for concrete aggregate and road stone.

**Columbia.**—Loncala Phosphate Co. increased production of soft-rock phosphate from its Fort White mine.

**Dade.**—Dade County ranked fourth as mineral producer in the State as measured by value of production, which totaled $8.4 million—an increase of 5 percent above 1955. Crushed limestone furnished $6.8 million (81 percent) of the total mineral production. At the end of the year 8 producers were active at 13 limestone quarries in the county, compared with 10 companies and 15 quarries in 1955. Maule Industries, Inc., purchased the Seminole Rock Products Co. in the first half of the year, and Three Bays Improvement Co. acquired the Hialeah Crushed Stone Co. in May 1956 and Murphy & Mills Corp. at the end of December. Other producers were: E. E. Collins Construction Co., T. J. James Construction Co., Naranja Rock Co., Oolite Rock Co., Peffer Construction Co., and Troup Quarries, Inc.

The city of Miami recovered 24,000 tons of lime as a byproduct of water purification.

Ideal Crushed Stone Co. produced sand and gravel for building purposes. Des Rochers Sand Co. produced building and paving sand, and T. J. James Construction Co., Inc., marketed unwashed sand for lawn dressing.

The Perlite, Inc., Hialeah plant expanded perlite shipped into the State for use as a lightweight aggregate.

**TABLE 11.—Crushed limestone sold or used by producers in Dade County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 2,614,484 | $2,915,869 | 1954 | 5,193,757 | $6,622,989 |
| 1952 | 3,579,192 | 3,793,305 | 1955 | 4,913,760 | 6,680,940 |
| 1953 | 4,038,367 | 3,805,333 | 1956 | 4,517,382 | 6,820,809 |

**Duval.**—Ilmenite, rutile and byproduct monazite and zircon were recovered in the Humphreys Gold Corp. mill near Jacksonville from sands dredged by the Rutile Mining Co. of Florida in Duval County. The mine of Titanium Division of National Lead Co. was inactive. However, total production of titanium concentrate was only 1 percent lower in tonnage but 5 percent higher in value than in 1955. Zircon production was unchanged from 1955, and monazite was 26 percent less in quantity but considerably higher in value. Crude perlite from out of State was expanded for lightweight aggregates by Tennessee Products & Chemical Corp.

**Escambia.**—Sand and gravel used principally for building purposes was the only mineral production in the county. Producers were: Campbell Sand & Gravel Co., Clark Sand Co., and Ward Gravel Co.

**Flagler.**—The county ranked third in value of mineral production owing to output of cement. Lehigh Portland Cement Co. mined and used coquina (limestone) in manufacturing masonry and portland cement in its plant at Bunnell.

**Gadsden.**—Fuller's earth was the principal mineral produced. In addition to production by the Floridin Co., Inc., and Minerals &

Digitized by Google

Chemical Corp. of America, whose mines have been active for many years, Magnet Cove Barium Corp. opened a new mine and processing plant at Hinson. Apalachee Correctional Institute mined 8,700 tons of miscellaneous clay for use in manufacturing heavy clay products. Florida Gravel Co. mined sand and gravel for building and paving use.

**Gilchrist.**—The Loncala Phosphate Co. mined soft phosphate rock, the only mineral produced.

**Hamilton.**—Tropical Peat Moss Co. produced peat moss near Jasper.

**Hernando.**—Crushed limestone production totaled 3.2 million tons valued at $5.1 million. Despite increased production by 3 of the 4 active producers, the closing of General Cement Co. quarry at the end of 1955 resulted in losses of 13 and 9 percent in quantity and value, respectively, below 1955. Producers were: Brooksville Rock Co., Inc. (Broco quarry), Camp Concrete Rock Co. (Gay quarry), Florida Rock Products Co. (Lansing quarry), and William P. McDonald Corp. of Florida (Conrock quarry). Florida Rock Products Co. new Diamond Hill quarry and crushing-screening plant was nearing completion at the end of the year; production was expected to begin early in 1957.

**TABLE 12.—Crushed limestone sold or used by producers in Hernando County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 911,217 | $1,608,711 | 1954 | 2,117,071 | $3,214,713 |
| 1952 | 1,110,629 | 1,855,308 | 1955 | 3,706,520 | 5,579,106 |
| 1953 | 1,503,297 | 2,426,951 | 1956 | 3,233,594 | 5,089,461 |

**Hillsborough.**—Cement, shell, and phosphate-rock production made Hillsborough rank second as a mineral producer in the State.

General Portland Cement Co. manufactured masonry and portland cement at its Tampa mill. American Agricultural Chemical Co. (Boyette) and American Cyanamid Co. (Sydney) mined and processed land-pebble-phosphate rock. Bay Dredging and Construction Co. and Radcliff Gravel Co. dredged oystershell for concrete aggregate, roadstone, poultry grit, and agricultural use. Agricultural Organics Corp., Seffner, and Jack O. Holmes, Tampa, produced peat for agricultural use.

**Indian River.**—Florida Minerals Co. produced sands containing ilmenite, rutile, and zircon at the Vero mine and shipped them to the Palm Bay plant for concentration and separation. Ben Walker mined structural sand, and Airlite Processing Corp. of Florida expanded raw perlite shipped into the State for use as lightweight concrete and plaster aggregate.

**Jackson.**—West Florida Lime Co. began producing dimension limestone (rough architectural blocks) from its new Fellows quarry.

**Lafayette.**—Williston Shell Rock Co. mined 172,000 tons of crushed limestone from the Dell quarry for concrete and roadstone. Suwannee River Sand Co. produced 27,000 tons of paving and railroad-ballast sand.

**Lake.**—Central Sand Co. produced structural and paving sand from its pit near Tavares.

Digitized by Google

**Leon.**—Building and paving sand was produced by Asa Paige Sand Co., Middle Florida Sand Co., and Johnson Sand Co., all of Tallahassee. Production totaled 60,000 tons.

**Levy.**—Crushed limestone production increased 25 percent in tonnage and 27 percent in value above 1955. As in 1955, active producers were: Connell & Shultz (Williston quarry), Dixie Lime Products Co. (Lebanon quarry), Levy County Lime Rock Co. (No. 1 and No. 3 quarries), United Limerock Co., Charles E. Peacock, and W & M Construction, Inc. (Raleigh quarry). The No. 2 quarry of Levy County Lime Rock Co. was inactive.

**TABLE 13.—Crushed limestone sold or used by producers in Levy County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 182,189 | $310,787 | 1954 | (1) | (1) |
| 1952 | 400,543 | 684,073 | 1955 | 756,964 | $958,230 |
| 1953 | 320,415 | 651,311 | 1956 | 947,521 | 1,218,820 |

[1] Figure withheld to avoid disclosing individual company confidential data.

**Manatee.**—Manatee Dolomite Co. and Southern Dolomite Co. produced crushed limestone for agricultural use. Ernest E. Rainey operated the Cedar Hammock quarry in the first half of the year to produce concrete aggregate and roadstone.

Dimension limestone was quarried by Bradenton Stone Co. (rough architectural blocks) and Florida Travertine Co. (cut stone, rubble, curbing, and flagging). Bradenton Dredging & Shell Co. produced oystershell for concrete and road material.

**Marion.**—The tonnage of crushed limestone produced in the county declined somewhat below 1955. Limestone was used principally for concrete aggregate and roadstone (69 percent), and agricultural stone (16 percent); the remaining tonnage was used for chemical purposes, lime, filler, and railroad ballast. Producers were the same as in 1955: W. L. Cobb Construction Co., Cummer Lime & Mfg. Co., Dixie Lime Products Co., and Ocala Lime Rock Co. Dixie Lime Products Co. also produced quick and hydrated lime at its kilns at Kendrick using part of its stone production for this purpose.

**TABLE 14.—Crushed limestone sold or used by producers in Marion County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) [1] | 533,896 | $620,785 | 1954 [1] | 1,171,124 | $1,187,158 |
| 1952 [1] | 748,760 | 1,010,099 | 1955 | 1,090,772 | 1,281,890 |
| 1953 [1] | 530,843 | 722,369 | 1956 | 1,006,526 | 1,288,977 |

[1] Exclusive of limestone used in manufacturing lime.

**Monroe.**—Charley Toppino & Sons was the only crushed-limestone producer in the county. Output from the Hoskins Rock quarry and Stock Island quarry increased 15 percent in tonnage and 55 in value. Keystone Art Co. quarried rubble and cut stone on Winley Key.

**Orange.**—Fernwood Humus Co., Zellwood, and Mulford-Hickerson Peat Humus, Apopka, produced humus peat and Daetwyler Peat mine, Orlando, marketed reed or sedge peat.

Digitized by Google

**Osceola.**—A. E. Hoffman produced building sand.

**Palm Beach.**—Total value of mineral production was almost identical with 1955. Crushed limestone for concrete aggregate and roadstone was quarried by Belle Glade Rock Co., Driskell & Mayo, Walter A. Hobbs, Jr., and the Palm Beach County Highway Department. Hoyt Sand & Muck Co. more than doubled its production of structural sand over 1955. Latham Farms produced humus peat for agricultural use.

**Pinellas.**—Charles E. Phillips mined a small tonnage of crushed limestone for concrete aggregate and roadstone, and Largo Washed Sand Co. produced 103,000 tons of sand principally for structural use.

**Polk.**—Polk County—the center of the phosphate industry in the United States—led in both tonnage and value of minerals produced. Output of land-pebble phosphate rock reached a new high; production was 36 percent higher in quantity and 39 percent greater in value than in 1955 and 15 and 16 percent above the record tonnage and value, respectively, of 1954. Producers were: American Agricultural Chemical Co. (South Pierce mine and Pierce mill), American Cyanamid Co. (Saddle Creek mine and Brewster plant), Coronet Phosphate Division, Smith Douglas Co. (Tenoroc mine and mill), Davison Chemical Division of W. R. Grace & Co. (Bonny Lake and Pauway mines and Ridgwood mill), International Minerals & Chemical Corp. (Achan, Noralyn and Peace Valley mines, Noralyn & Mulberry mills), Swift & Co. (Varn and Watson mines, Agricola mill), and Virginia-Carolina Chemical Corp. (Homine & Clear Springs mines and mills, Phosmico and Nichols mills). Armour & Co. resumed mining early in 1956 to supply its Bartow plant with crude phosphate rock, formerly bought from other producers.

Production of sand, principally for building and paving use, was considerably higher than in 1955. Producers were: Davenport Sand Co., Inc., Lake Wales Concrete Sand Co., and Lake Wales Independent Sand Co., all of Lake Wales; MacCalla Bros., Winter Haven; Mammoth Sand Co., Pembroke; Oak Ridge Sand Co., Inc., Mulberry; Standard Sand & Silica Co., Davenport; and Waverly Road Sand Co., Winter Haven (the latter company a new producer in 1956).

**Putnam.**—United Clay Mines Corp. and Edgar Plastic Kaolin Co. mined kaolin principally for whiteware and floor and wall tile. Edgar Plastic Kaolin Co. was a new sand producer in 1956, having installed equipment to recover building and industrial sands as a byproduct in its kaolin operation. United Clay Mines Corp. was also a producer of structural sand. Other companies mining structural and paving sand were: All-Florida Sand Co., Diamond Interlacken Sand Co., Inc., Keuka Sand Co. and Keystone Sand Co. Glenn St. Marys Nurseries Co., Palatka Peat Humus Co. and Southern States Nurseries, Inc., produced peat humus near Florahome.

**St. Johns.**—Phillip McLeod—the only active producer in the county—quarried limestone, both cut dimension and crushed, for concrete aggregate and roadstone.

**St. Lucie.**—Florida East Coast Railway Co. produced a small tonnage of engine sand.

**Sarasota.**—Florida Dolomite Co. produced 452,000 tons of crushed limestone for agricultural use—a 23-percent increase over 1955.

Digitized by Google

**Sumter.**—Central Quarries, Inc., and Sumter Lime Products Co. quarried and crushed limestone for concrete aggregate and roadstone.

**Suwannee.**—The methods of Suwannee Lime Rock Co. and Live Oak Stone Co. for producing crushed limestone for concrete aggregate and roadstone were described.[3]

**Volusia.**—White Sand & Materials Co. was the only active sand producer compared with three in the previous year.

**Washington.**—Miller & Jerkins, a new producer, mined structural and paving sand.

---

[3] Walter E. Trauffer, Scarce Concrete Aggregates Produced at New Plant in Northern Florida: Pit and Quarry, vol. 49, No. 3, September 1956, pp. 124–126.

Digitized by Google

Digitized by Google

# The Mineral Industry of Georgia

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Georgia.

By James L. Vallely [1] and Garland Peyton [2]

THE VALUE of Georgia's mineral production in 1956 was $67.9 million—12 percent higher than the $60.4 million output in 1955. As in previous years, clays, stone, cement, sand and gravel, barite, iron ore, and slate, in that order, were the principal mineral products. Except for slate and sand and gravel, the value of all nonmetallic minerals was higher than in 1955. Of the metals, beryl, iron ore, and manganese increased in value and bauxite declined. Coal and peat also lost in value from 1955.

Mineral production was reported from 68 of Georgia's 159 counties, 16 accounted for $59.8 million or 88 percent of the total production.

**TABLE 1.—Mineral production in Georgia, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 2,953,278 | $26,144,672 | 3,047,467 | $29,500,993 |
| Coal | 12,471 | 62,360 | 8,471 | 42,355 |
| Gem stones | [2] | [2] | [2] | 150 |
| Iron ore (usable)—long tons | 256,700 | 994,289 | 356,735 | 1,609,093 |
| Iron oxide pigments (crude) | 6,139 | 35,607 | [2] | [2] |
| Mica: Scrap | [3] | 353,322 | [2] | [2] |
| Sheet—pounds | | | 20,149 | 149,459 |
| Peat | 55,554 | [3] | 6,225 | 47,843 |
| Sand and gravel | 2,987,570 | 2,198,905 | 2,425,832 | 2,183,260 |
| Stone | [4] 7,488,452 | [4] 14,249,830 | [4] 9,196,065 | [4] 20,713,651 |
| Talc | 53,828 | 117,656 | 57,916 | 122,166 |
| Value of items that cannot be disclosed: Barite, bauxite, beryllium concentrates, cement, feldspar, manganese, slate, sandstone (crushed), marble (crushed) (1955–56), marble (dimension) (1955), and values indicated by footnote 3 | ---------- | 17,142,098 | ---------- | 14,558,174 |
| Total Georgia [5] | ---------- | 60,417,000 | ---------- | 67,912,000 |

[1] Production as measured by mine shipments, mine sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing of individual company confidential data.
[4] Excludes certain stone, value for which is included with "Items that cannot be disclosed."
[5] The total has been adjusted to eliminate duplicating the value of clays and stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Knoxville, Tenn.
[2] State geologist, Georgia Geological Survey, Atlanta, Ga.



Digitized by Google

Rated on value of output in the order listed below, Twiggs, Washington, Pickens, Wilkinson, Houston, De Kalb, Bartow, Polk, Gilmer, Richmond, Elbert, Henry, Warren, Fayette, Decatur, and Muscogee were the most important mineral-producing counties in the State; the production of each was valued above $1 million.

Under the Defense Minerals Exploration Administration (DMEA) program to aid in exploring for and developing strategic minerals, 5 contracts were in effect; 2 in Hart County for mica were new, and 2 for mica in Cherokee and Upson Counties and 1 for beryl in Troup County were carried over from 1955. These contracts totaled $32,980, and Government participation was 75 percent, compared with 4 exploration projects totaling $26,072 in 1955.

**TABLE 2.—Average unit value of mineral commodities produced in Georgia, 1952–56** [1]

| Commodity | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Asbestos short ton | $100.00 | $100.00 | $100.00 | | |
| Barite do | 11.75 | 12.82 | 13.91 | $13.73 | $18.73 |
| Beryl do | 596.00 | | 654.75 | 394.50 | 618.50 |
| Cement: | | | | | |
| Masonry 376-pound barrel | | | | 3.31 | 2.62 |
| Portland do | 2.54 | 2.65 | 2.71 | 2.76 | 3.00 |
| Clays: | | | | | |
| Fuller's earth short ton | 18.11 | 18.73 | 19.98 | 21.43 | 21.97 |
| Kaolin (china, paper, etc.) do | [2] 15.40 | 15.89 | 16.49 | 16.67 | 17.37 |
| Kaolin (refractory) do | [2] 6.37 | 6.60 | 7.39 | 6.80 | 6.13 |
| Miscellaneous do | .97 | .93 | .80 | .40 | .40 |
| Coal do | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Feldspar long ton | | | 8.22 | 8.40 | 13.46 |
| Gold troy ounce | | 35.00 | | | |
| Iron ore long ton | 4.50 | 4.23 | 3.93 | 3.87 | 4.51 |
| Lime short ton | 11.15 | 10.22 | 9.92 | | |
| Manganese ore long ton | | | [3] | [3] | [3] |
| Manganiferous ore do | | | | [3] | [3] |
| Mica, sheet pound | 1.45 | 5.25 | 5.01 | 11.49 | 7.42 |
| Mica, scrap and flake short ton | 25.88 | 24.01 | [3] | [3] | 13.50 |
| Mineral pigments (crude) do | [4] | [4] | 3.91 | 5.80 | 7.42 |
| Peat do | 17.67 | 17.38 | 11.83 | 8.90 | 7.69 |
| Sand and gravel: | | | | | |
| Gravel do | [2] 1.53 | 1.57 | 1.63 | .61 | [5] |
| Sand: | | | | | |
| Ground do | 10.00 | 10.00 | [4] | [4] | [4] |
| Structural and paving do | .69 | .65 | .69 | .63 | .69 |
| All other do | 1.48 | 1.70 | 1.20 | 1.56 | 2.31 |
| Slate (crushed and ground) do | 7.41 | 7.41 | 5.63 | 4.32 | 3.65 |
| Stone: | | | | | |
| Granite: | | | | | |
| Crushed do | 1.55 | 1.56 | 1.59 | 1.47 | 1.43 |
| Dimension do | [2] 18.60 | 19.04 | 19.03 | 18.96 | 28.09 |
| Limestone: | | | | | |
| Crushed do | 2.87 | 2.48 | 2.06 | 1.48 | 2.46 |
| Dimension do | 3.76 | 2.58 | 2.79 | 2.50 | 1.62 |
| Marble: | | | | | |
| Crushed do | | 8.35 | 8.43 | 7.21 | 6.95 |
| Dimension do | 130.67 | 136.65 | 123.63 | 123.34 | 160.39 |
| Miscellaneous: | | | | | |
| Crushed do | .25 | | | | |
| Dimension do | 10.78 | | | | |
| Sandstone: | | | | | |
| Crushed (quartzite) do | 1.66 | 1.56 | 1.42 | 1.42 | 1.42 |
| Dimension do | | | | | 25.28 |
| Talc: | | | | | |
| Crude do | [4] | 3.50 | 3.50 | 2.19 | 2.11 |
| Ground do | 10.24 | 10.33 | 10.05 | 10.09 | 10.04 |

[1] For greater detail on prices, by grades and markets, see volume I, Minerals Yearbook, 1956.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Revised figure.
[4] Data not available.
[5] Included with "All other."

Digitized by Google

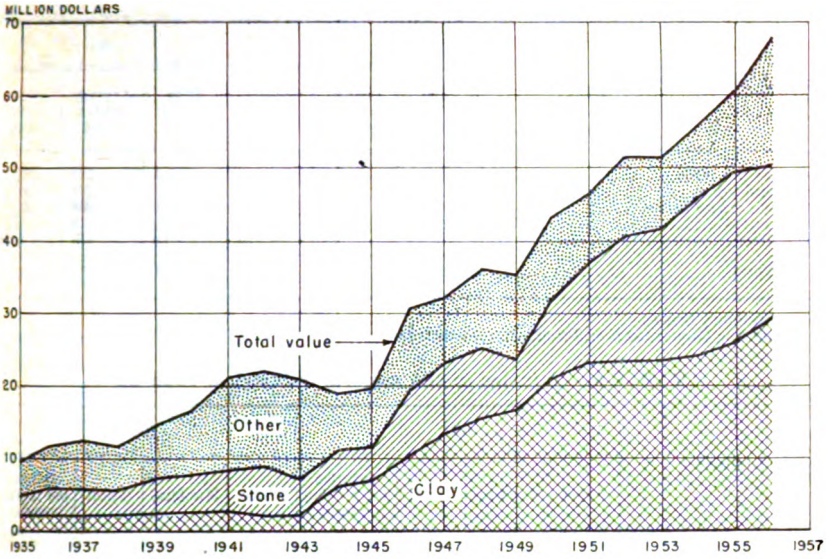



FIGURE 1.—Value of clays and stone and total value of mineral production in Georgia, 1935–56.

**TABLE 3.—Defense Minerals Exploration Administration contracts in 1956**

| County and contractor | Property | Commodity | Contract | |
|---|---|---|---|---|
| | | | Date | Total amount [1] |
| Cherokee: J. R. Beam | Bennett mine | Mica | July 11, 1955 | $8,316 |
| Hart: | | | | |
| Ernest B. Wood | E. B. Wood prospect | do | July 23, 1956 | 6,348 |
| John Phillips | Bray prospect, No. 1 | do | Sept. 5, 1956 | 6,276 |
| Troup: W. Hugh Allen | Word mine | Beryl | Nov. 21, 1955 | 6,516 |
| Upson: Edwin H. Schwab | Duke mine | Mica | Oct. 6, 1955 | 5,524 |

[1] Government participation, 75 percent of total amount.

## EMPLOYMENT AND INJURIES

Reports submitted to the Bureau of Mines indicate that employment in the mineral industries expanded 52 percent above 1955. Employment at quarries and mills increased 24 percent, expanded nearly 3 times at nonmetal mines, was about the same at sand and gravel mines, decreased 12 percent at metal mines, and declined 64 percent at coal mines.

Injury experience improved considerably over 1955; the frequency rate decreased 24 percent below 1955. No injuries were reported at coal mines. The frequency rate declined 46 percent at nonmetal mines and decreased 11 percent at quarries and mills. Four fatal injuries occurred, compared with 1 in 1955.

Digitized by Google

**TABLE 4.—Employment in the mineral industries, 1955–56**

| Industry | 1955 | | | 1956 [1] | | |
|---|---|---|---|---|---|---|
| | Men working daily | Average active days | Man-days worked | Men working daily | Average active days | Man-days worked |
| Quarries and mills | 1,714 | 258 | 441,390 | 2,044 | 268 | 547,834 |
| Nonmetal mines | 611 | 257 | 156,817 | 1,666 | 244 | 406,932 |
| Sand and gravel mines [2] | 254 | 266 | 67,548 | 261 | 259 | 67,710 |
| Metal mines | 35 | 198 | 6,937 | 28 | 218 | 6,097 |
| Coal mines | 25 | 173 | 4,326 | 12 | 128 | 1,536 |
| Total | 2,639 | 257 | 677,018 | 4,011 | 257 | 1,030,109 |

[1] Preliminary figures.
[2] Excluding Government-and-contractor operations.

**TABLE 5.—Injuries in the mineral industries, 1955–56**

| Industry [1] | 1955 | | | | 1956 [2] | | | |
|---|---|---|---|---|---|---|---|---|
| | Fatal | Nonfatal | Total | Injuries per million man-days | Fatal | Nonfatal | Total | Injuries per million man-days |
| Coal mines | | 1 | 1 | 231 | | | | |
| Nonmetal mines | | 59 | 59 | 376 | | 82 | 82 | 202 |
| Quarries and mills | 1 | 125 | 126 | 285 | 4 | 135 | 139 | 254 |
| Metal mines | | | | | | 3 | 3 | 492 |
| Total | 1 | 185 | 186 | 305 | 4 | 220 | 224 | 233 |

[1] Sand and gravel mines not canvassed.
[2] Preliminary figures.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Bauxite.**—Production of bauxite was 18 percent higher than the previous year; value, however, was 10 percent lower due to larger tonnages of high-silica bauxite mined. American Cyanamid Co., the only producer operated mines in Floyd, Macon, and Sumter Counties, transferring the crude ore to the Halls Station plant in Bartow County for drying before shipment for chemical uses.

**Beryllium.**—Beryl production increased considerably over 1955 but was still far below the record output in 1954. The Hogg mine of Mineral Processing Co., Troup County, was the principal producer. W. Hugh Allen continued exploring the Word mine under a DMEA contract.

**Iron Ore.**—Brown-iron-ore shipments increased in 1956 for the second straight year to 357,000 tons valued at $1.6 million, 39 and 62 percent higher in tonnage and value, respectively, than in 1955. Initial production of 55,000 tons valued at $277,000 from Stewart County, just below the fall line on the western border of the State, combined with increased output from Bartow and Polk Counties, furnished the substantial increase. Twenty-five operators were active during the year, compared with 12 during 1955; 7 of the new companies were mining in Stewart County.

**Manganese.**—Production of both manganese and manganiferous ores greatly exceeded that of 1955. Manganese ore (plus 35 percent

Digitized by Google

**TABLE 6.—Production and shipments of usable brown iron ore, 1947–51 (average) and 1952–56 [1]**

| Year | Production | Shipments | | Year | Production | Shipments | |
|---|---|---|---|---|---|---|---|
| | Long tons | Long tons | Value | | Long tons | Long tons | Value |
| 1947–51 (average) | 271,719 | 271,719 | $829,890 | 1954 | 221,576 | 221,576 | $871,901 |
| 1952 | 369,259 | 319,959 | 1,439,251 | 1955 | 256,700 | 256,700 | 994,289 |
| 1953 | 210,664 | 259,964 | 1,100,725 | 1956 | 356,735 | 356,735 | 1,609,093 |

[1] Includes hematite: 1950—213 tons; 1951—266 tons; 1952—200 tons; 1953—250 tons; 1954—217 tons.

Mn) was sold to the Government through the General Services Administration for stockpiling and manganiferous ore (10 to 35 percent Mn) was sold for use in Alabama blast furnaces. Output came from Bartow and Floyd Counties.

## NONMETALS

**Barite.**—Output of crude barite increased only 1 percent, but its value was up 38 percent over 1955. Barite was sold for use in drilling muds and barium chemicals and as fillers. All production came from Bartow County.

**Cement.**—Portland-cement production increased 9 percent in quantity and 19 percent in value over 1955. Masonry cement, although down 5 percent in quantity, was up 4 percent in value. Marquette Cement Mfg. Co., Rockmart, manufactured portland and masonry cements and Penn-Dixie Cement Corp., Clinchfield, manufactured portland cement only.

**Clays.**—Clays continued to lead the State's minerals in terms of value. Total clay production was 3 million tons valued at $29.5 million compared with 2.95 million tons valued at $26.1 million in 1955, increases of 3 percent in tonnage and 13 percent in value. Refractory kaolin for the second year recorded the greatest gains percentagewise, increasing 33 percent in tonnage and 20 in value. Kaolin for china, paper, fillers, etc., totaled 1.5 million tons valued at $25.4 million—advances of 9 percent in tonnage and 14 in value. Fuller's earth reversed a downward trend started in 1952 with production in 1956, increasing 5 and 7 percent in tonnage and value, respectively, over 1955. Two new companies in Jefferson and Thomas Counties started production during the year. Miscellaneous clay decreased 6 percent in both tonnage and value over 1955. Clays were produced in 19 counties, including fuller's earth in Decatur, Grady, Jefferson, Thomas, and Twiggs Counties; and kaolin in Baldwin, Glasscock, Richmond, Twiggs, Washington, and Wilkinson Counties. Other clays were

**TABLE 7.—Clays sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 2,288,793 | $18,753,604 | 1954 | 2,711,422 | $24,106,926 |
| 1952 | 2,562,182 | 23,137,507 | 1955 | 2,953,278 | 26,144,672 |
| 1953 | 2,651,153 | 23,455,315 | 1956 | 3,047,467 | 29,500,993 |

Digitized by Google

**TABLE 8.—Kaolin sold or used by producers, 1947–51 (average) and 1952–56**

| Year | China clay, paper clay, etc. | | Refractory uses | | Total kaolin | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 1,009,270 | $14,656,057 | 133,792 | $793,010 | 1,143,062 | $15,449,067 |
| 1952 | 1,145,063 | 17,635,838 | 183,192 | 1,166,355 | 1,328,255 | 18,802,193 |
| 1953 | 1,170,679 | 18,606,351 | 171,046 | 1,053,274 | 1,341,725 | 19,659,625 |
| 1954 | 1,196,211 | 19,722,623 | 108,654 | 803,283 | 1,304,865 | 20,525,906 |
| 1955 | 1,339,748 | 22,333,808 | 153,235 | 1,041,960 | 1,492,983 | 23,375,768 |
| 1956 | 1,459,627 | 25,353,611 | 204,080 | 1,251,280 | 1,663,707 | 26,604,891 |

**TABLE 9.—Miscellaneous clay sold or used by producers, 1947–51 (average) 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 1,000,989 | $809,273 | 1954 | 1,278,377 | $1,020,486 |
| 1952 | 1,050,792 | 1,020,132 | 1955 | 1,356,412 | 542,608 |
| 1953 | 1,163,766 | 1,076,891 | 1956 | 1,275,128 | 509,980 |

mined in Bibb, Columbia, Crawford, Floyd, Fulton, Gordon, Houston, Polk, Richmond, Thomas, and Whitfield Counties.

**Feldspar.**—Appalachian Minerals Corp. mined feldspar rock and produced flotation concentrate at its mill at Monticello. Output was 58 percent above 1955.

**Gem Stones.**—Corundum from Towns County and rose quartz from Troup were the only gem stones reported during the year.

**Iron Oxide Pigments (Crude).**—Crude iron oxide pigments were produced by the New Riverside Ochre Co. from its pit at Cartersville, Bartow County. Although production value was higher, the tonnage of crude material was lower than in 1955. Finished-pigment production in 1956 changed little from the previous year.

**Mica.**—Although the quantity of both sheet and scrap mica produced in 1956 was greater, the total value of production was considerably less than in 1955. Scrap mica increased 4 percent in tonnage but decreased 26 percent in value. Sheet-mica production in 1956 was 20,000 pounds valued at $149,000, including 2,300 pounds of sheet mica obtained from 58,000 pounds of hand-cobbed mica. Except for uncut punch and circle, all sheet and hand-cobbed mica was sold to the Government through the General Services Administration (GSA) at the Spruce Pine (N. C.) Purchase Depot. Upson was the principal sheet-producing county; other counties mining smaller quantities were Cherokee, Hart, Monroe, Oconee, and Polk Counties. Scrap mica came from Cherokee, Hart, Pickens, and Upson Counties.

Four DMEA mica-exploration contracts were active in 1956—1 each in Cherokee and Upson Counties and 2 in Hart County. The total amount of the contracts was $26,464; Government participation was 75 percent.

**Sand and Gravel.**—Production of sand and gravel, although ranking third in the State in terms of mineral value, decreased 19 percent in tonnage and 1 percent in value below 1955 to 2.4 million tons valued at $2.18 million compared with 3 million tons at $2.20 million in 1955. Building, blast, and filter sands increased, but all other classes of

Digitized by Google

sand decreased in both tonnage and value from the previous year. Gravel production was far below that in 1954 and 1955, but figures are confidential company information and may not be revealed.

Sand was produced in 19 counties, gravel in 3, and both sand and gravel in 4. Twenty-nine companies mined from 33 pits and 4 Government-and-contractor agencies operated individual pits in the 26 producing counties.

**TABLE 10.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 1,111,033 | $825,938 | 1954 | [1] 2,703,281 | [1] $2,466,352 |
| 1952 | 2,133,970 | 2,029,367 | 1955 | [1] 2,987,570 | [1] 2,198,905 |
| 1953 | 2,051,058 | 1,900,987 | 1956 | [1] 2,425,832 | [1] 2,183,260 |

[1] Includes ground sand formerly reported separately.

**TABLE 11.—Sand and gravel sold or used by producers, by classes of operations and uses, 1955–56**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Sand—commercial: | | | | |
| Glass | 56,903 | $116,257 | (1) | (1) |
| Molding | 77,754 | 194,385 | (1) | (1) |
| Building | 1,345,444 | 910,549 | 1,617,396 | $1,122,671 |
| Paving | 330,386 | 208,014 | 273,635 | 176,223 |
| Grinding and polishing | 1,133 | 600 | 849 | 467 |
| Blast | 21,582 | 107,910 | (1) | (1) |
| Engine | 115,177 | 5,991 | 12,564 | 5,902 |
| Filter | 5,247 | 26,235 | (1) | (1) |
| Railroad ballast | 1,045 | 491 | 10,742 | 5,370 |
| Other | [2] 79,026 | [2] 106,452 | [2] 77,319 | [2] 101,010 |
| Total | 2,033,697 | 1,676,884 | [2] 1,992,505 | [2] 1,411,643 |
| Government-and-contractor | 198,775 | 59,650 | 6,510 | 7,700 |
| Total sand | 2,232,472 | 1,736,534 | [2] 1,999,015 | [2] 1,419,343 |
| Gravel: | | | | |
| Total | 755,098 | 462,371 | (1) | (1) |
| Sand and gravel: | | | | |
| Grand total | 2,987,570 | 2,198,905 | 2,425,832 | 2,183,260 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes ground sand.
[3] Incomplete total.

**Slate.**—Production of crushed and ground slate was 8 percent higher in tonnage but was 8 percent lower in value compared with 1955. Funkhouser Co. mined slate near Fairmont, Bartow County, for roofing granules; Lightweight Aggregate Co. quarried slate for use in its lightweight-aggregate plant at Rockmart in Polk County.

**Stone.**—Total stone production, including all marble, quartzite, and sandstone, which do not appear in the production table, exceeded that in 1955 by 15 and 9 percent in tonnage and value, respectively.

Total crushed stone was higher in both tonnage and value. Crushed granite increased 24 percent in tonnage and 20 in value. Crushed-limestone figures are not comparable for 1955 and 1956, as some

Digitized by Google

crushed and ground limestone was classed as marble in 1955. Output of crushed sandstone and quartzite was 10 percent lower than in 1955.

Total dimension-stone production was lower in 1956 than in 1955. Dimension granite decreased 33 percent in tonnage; but its value was only 1 percent less than in 1955, and marble decreased in both tonnage and value. Only small tonnages of dimension limestone and sandstone were produced.

Granite was produced in 15 counties; quartzite in Richmond County; sandstone in Pickens County; limestone in Bartow, Dade, Fannin, Floyd, Gilmer, Houston, and Walker Counties; and marble in Gilmer and Pickens Counties.

**TABLE 12.—Stone sold or used by producers, 1954–56, in short tons**

| | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Crushed stone: | | | | | | |
| Granite | 5,078,952 | $8,080,493 | 5,923,422 | $8,729,902 | 7,348,901 | $10,496,767 |
| Limestone | 1,806,899 | 3,722,108 | 1,379,607 | 2,041,352 | 1,704,412 | 4,187,368 |
| Marble | 218,678 | 1,843,530 | (1) | (1) | (1) | (1) |
| Sandstone and quartzite | 725,000 | 1,030,000 | (1) | (1) | (1) | (1) |
| Total | 7,829,529 | 14,676,131 | [2] 7,303,029 | [2] 10,771,254 | [2] 9,053,313 | [2] 14,684,135 |
| Dimension stone: | | | | | | |
| Granite | 193,270 | 3,678,193 | 181,879 | 3,447,761 | 121,014 | 3,398,720 |
| Limestone | 3,065 | 8,545 | 2,247 | 5,615 | 4,405 | 7,150 |
| Marble | 24,251 | 2,998,031 | (1) | (1) | 16,175 | 2,594,366 |
| Sandstone and quartzite | 7,485 | 23,387 | 1,297 | 25,200 | 1,158 | 29,280 |
| Total | 228,071 | 6,708,096 | [3] 185,423 | [3] 3,478,576 | 142,752 | 6,029,516 |
| Grand total | 8,057,600 | 21,384,227 | [3] 7,488,452 | [3] 14,249,830 | [3] 9,196,065 | [3] 20,713,651 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Incomplete total; excludes crushed marble and crushed sandstone and quartzite.
[3] Incomplete total; excludes marble and crushed sandstone and quartzite.

**Talc and Soapstone.**—Production of crude talc and soapstone was 58,000 tons valued at $122,000—an increase of 8 percent in tonnage and 4 percent in value compared with 1955. Sales of ground talc and soapstone were 57,500 tons valued at $577,000—8 percent in quantity and 7 percent in value above 1955. Sales of sawed material were a few percent below the previous year, but total value was up 6 percent. All production came from Murray County.

**TABLE 13.—Production of crude and sales of ground talc and soapstone, 1947–51 (average) and 1952–56**

| Year | Production (crude) | | Sales (ground) | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| 1947–51 (average) | (1) | (1) | [2] 60,205 | [2] $695,126 |
| 1952 | 58,411 | (1) | 56,181 | 575,033 |
| 1953 | 57,891 | $202,619 | 57,581 | 594,900 |
| 1954 | 50,536 | 176,876 | 50,248 | 505,219 |
| 1955 | 53,828 | 117,656 | 53,419 | 538,890 |
| 1956 | 57,916 | 122,166 | 57,521 | 577,475 |

[1] Data not available.
[2] Includes sawed material.

Digitized by Google

## MINERAL FUELS

**Coal.**—Bituminous-coal production came from 1 strip mine and 4 underground mines—all in Walker County. Output was 8,500 tons valued at $42,000, decreases of 32 percent in both tonnage and value below 1955.

**Peat.**—Production of peat in 1956 was 6,200 tons valued at $48,000, 12 percent higher in tonnage but slightly lower in value than in 1955. Peat humus, although classed as a fuel, was used principally for agricultural and horticultural purposes. Only 3 producers were active in the State in 1956—1 each in Charlton, Lowndes, and Screven Counties.

**TABLE 14.—Production of peat, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 2,154 | $47,200 | 1954 | 5,150 | $60,920 |
| 1952 | 2,150 | 38,000 | 1955 | 5,554 | (1) |
| 1953 | 2,305 | (1) | 1956 | 6,225 | 47,843 |

[1] Figure withheld to avoid disclosing confidential company information.

## REVIEW BY COUNTIES

**Baldwin.**—General Refractories Co. mined kaolin from the Wood mine at Stevens Pottery for its own use in manufacturing refractory products.

**Bartow.**—Mineral production in Bartow County increased for the third successive year and was 27 percent higher than in 1955. In terms of value, barite was the principal mineral of the county, and output was slightly above 1955, but its value was up 38 percent. B. R. Cain, Homer Cox, New Riverside Ochre Co., and Paga Mining Co. were active producers. Although no bauxite was mined in the county in 1956, the Halls Station plant of American Cyanamid Co. continued to dry crude ore shipped from other sections of the State.

Shipments of brown iron ore were 179,000 tons valued at $727,000, declining 3 percent in tonnage but increasing 15 percent in value from 1955. The principal producers, as in 1955, were Bartow Mines, Inc., Hodge Mining Co., Lake Mining Co., and Mosteller Bros. In addition, six new small producers made their first shipments during the year. Crude and finished iron oxide pigments were produced by New Riverside Ochre Co. Manganese and manganiferous ores were mined by Hale-Georgia Minerals Corp. and Sam Dysart.

Stockbridge Stone Co. abandoned its limestone quarry at White, and Marquette Cement Mfg. Co. opened a new limestone quarry

**TABLE 15.—Shipments of brown iron ore in Bartow County, 1948–51 (average) and 1952–56**

| Year | Long tons | Value | Year | Long tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 86,143 | $282,916 | 1954 | 148,601 | $564,778 |
| 1952 | 146,332 | 585,476 | 1955 | 184,892 | 632,516 |
| 1953 | 113,024 | 447,169 | 1956 | 179,485 | 726,557 |

Digitized by Google

near Cartersville to supply cement rock for its plant at Rockmart. Funkhouser Co. mined slate at its underground mine in the northern part of the county for slate flour and roofing granules.

**Bibb.**—The total value of mineral production in Bibb County in 1956 was 19 percent higher than in 1955. Hitchcock Corp. and Macon Quarries produced crushed granite for concrete and road metal. Burns Brick Co. and Cherokee Brick & Tile Co. mined clays for manufacturing clay products in their plants at Macon. Cornell-Young Co. operated sand pits near Macon and Warner-Robbins for structural and paving sands.

**Brooks.**—Bannockburn Sand Co. of Valdosta mined building and paving sands from its pit at Troupeville.

**Charlton.**—Okefenokee Peat Moss Co. produced peat humus near Cypress.

**Chatham.**—J. W. Fitzgerald Co., Inc., mined building sand from its pit near Savannah. National Gypsum Co. calcined crude gypsum shipped into the State at its Savannah plant.

**Cherokee.**—Thompson-Weinman & Co. mined and shipped mica (sericite) from the Brady mine to its grinding plant at Cartersville. Beryl and sheet mica were produced by Frank Cook Mining Co. (Bennett mine) and Glenn Young (Cochran mine). J. R. Beam ex-

**TABLE 16.—Value of mineral production in Georgia, 1955–56, by counties** [1]

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Baldwin | (2) | (2) | Kaolin. |
| Bartow | $2,934,341 | $3,716,987 | Barite, iron ore, limestone, slate, manganese. |
| Bibb | 712,282 | 845,905 | Granite, clays, sand and gravel. |
| Brooks | 61,750 | 38,190 | Sand. |
| Charlton | | (2) | Peat. |
| Chatham | (2) | (2) | Sand. |
| Cherokee | (2) | (2) | Mica, beryl. |
| Cobb | 494,018 | 845,392 | Granite, sand. |
| Colquitt | | 20,000 | Sand. |
| Columbia | (2) | (2) | Clays. |
| Crawford | 246,823 | 277,973 | Clays, sand. |
| Dade | (2) | 33,152 | Limestone. |
| Decatur | (2) | (2) | Fuller's earth. |
| De Kalb | 3,839,858 | (2) | Granite. |
| Dougherty | 123,268 | 122,019 | Sand. |
| Effingham | 236,926 | (2) | Do. |
| Elbert | 1,483,379 | 1,523,140 | Granite, sand. |
| Evans | 3,850 | 6,370 | Sand. |
| Fannin | 83,178 | 110,725 | Limestone, granite. |
| Fayette | (2) | (2) | Granite. |
| Floyd | 551,537 | 704,433 | Limestone, manganese, bauxite. |
| Fulton | 89,650 | (2) | Granite, sand and gravel, clays. |
| Gilmer | (2) | (2) | Limestone, marble. |
| Glascock | | (2) | Kaolin. |
| Glynn | (2) | (2) | Sand. |
| Gordon | 11,290 | 12,000 | Clays. |
| Grady | (2) | (2) | Fuller's earth. |
| Gwinnett | 134,750 | 197,093 | Granite. |
| Hancock | (2) | (2) | Do. |
| Haralson | 4,000 | 5,000 | Sand and gravel. |
| Hart | (2) | (2) | Mica. |
| Henry | (2) | 1,445,443 | Granite. |
| Houston | (2) | (2) | Cement, limestone. |
| Jasper | (2) | (2) | Feldspar, quartz. |
| Jefferson | | 19,475 | Fuller's earth. |
| Jones | (2) | | |
| Lamar | (2) | | |
| Long | (2) | (2) | Sand. |
| Lowndes | (2) | (2) | Peat. |
| Macon | (2) | (2) | Bauxite. |
| Madison | 413,337 | 479,049 | Granite. |

See footnotes at end of table.

Digitized by Google

**TABLE 16.—Value of mineral production in Georgia, 1955–56, by counties [1]—Continued**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Monroe | (2) | (2) | Mica. |
| Montgomery | (2) | | |
| Morgan | $200 | | |
| Murray | 117,656 | $122,166 | Talc, soapstone. |
| Muscogee | 934,556 | 1,122,131 | Granite, sand and gravel. |
| Oconee | | (2) | Mica. |
| Oglethorpe | 558,627 | 630,121 | Granite. |
| Pickens | (2) | (2) | Marble, sandstone, mica. |
| Pike | (2) | | |
| Polk | (2) | (2) | Cement, iron ore, slate. |
| Rabun | | 3,750 | Gravel. |
| Richmond | 2,285,440 | 2,307,339 | Quartzite, kaolin, clays. |
| Screven | (2) | (2) | Peat. |
| Stephens | 51,869 | 51,869 | Granite. |
| Stewart | | 277,427 | Iron ore. |
| Sumter | 35,000 | (2) | Bauxite. |
| Talbot | (2) | (2) | Sand. |
| Taylor | | (2) | Do. |
| Telfair | (2) | (2) | Do. |
| Thomas | (2) | (2) | Sand, fuller's earth. |
| Toombs | 2,250 | 5,200 | Sand. |
| Towns | | 50 | Gem stones. |
| Troup | (2) | (2) | Beryl, gem stones. |
| Twiggs | 14,331,993 | 16,365,323 | Kaolin, fuller's earth. |
| Union | 7,239 | 3,400 | Gravel. |
| Upson | (2) | 134,515 | Mica. |
| Walker | 199,349 | 139,065 | Limestone, coal. |
| Ware | 26,074 | 22,324 | Sand. |
| Warren | (2) | (2) | Granite. |
| Washington | 4,543,775 | 5,344,237 | Kaolin. |
| Wayne | 80,000 | | |
| Whitfield | (2) | 15,200 | Clay. |
| Wilkinson | 4,235,741 | (2) | Kaolin. |
| Undistributed | 21,582,750 | 30,965,311 | |
| Total | 60,417,000 | 67,912,000 | |

[1] The following counties are not listed, since no production has been reported from them: Appling, Atkinson, Bacon, Baker, Banks, Barrow, Ben Hill, Berrien, Bleckley, Brantley, Bryan, Bulloch, Burke, Butts, Calhoun, Camden, Candler, Carroll, Catoosa, Chattahoochee, Chatooga, Clark, Clay, Clayton, Clinch, Coffee, Cook, Coweta, Crisp, Dawson, Dodge, Dooly, Douglas, Early, Echols, Emanuel, Forsyth, Franklin, Greene, Habersham, Hall, Harris, Heard, Irwin, Jackson, Jeff Davis, Jenkins, Johnson, Lanier, Laurens, Lee, Liberty, Lincoln, Lumpkin, McDuffie, McIntosh, Marion, Meriwether, Miller, Mitchell, Newton, Paulding, Peach, Pierce, Pulaski, Putnam, Quitman, Randolph, Rockdale, Schley, Seminole, Spalding, Taliaferro, Tattnall, Terrell, Tift, Treutlen, Turner, Walton, Webster, Wheeler, White, Wilcox, Wilkes, Worth.

[2] Figure withheld to avoid disclosing individual company confidential data.

plored the Bennett mine under a DMEA contract totaling $8,316; Government participation was 75 percent.

**Cobb.**—Crushed granite was quarried by Kennesaw Stone Co. and Stockbridge Stone Co.; the latter operated a portable plant at a quarry acquired from Cobb County. Alonzo Field produced structural sand at Smyrna.

**Colquitt.**—Baxter & Sanders opened a new sand pit near Moultrie.

**Columbia.**—Georgia Vitrified Brick & Clay Co. mined clay from the Campania mine for use in its clay-products plant at Harlem.

**Crawford.**—Atlanta Sand & Supply Co. produced sand principally for building purposes from the Rolls pit near Roberts. Middle Georgia Pottery Co. mined clay for use in its plant at Lizella.

**Dade.**—Dave L. Brown Co. quarried and crushed limestone for concrete and roadstone. No coal was produced in 1956.

**Decatur.**—Minerals & Chemical Corp. of America mined and processed fuller's earth and was the only mineral producer in the county in 1956.

Digitized by Google

**De Kalb.**—Crushed and dimension granite were quarried near Lithonia. Consolidated Quarries, Inc., crushed granite for concrete and roadstone, railroad ballast, and stone sand. Stone Mountain Grit Co. produced concrete and roadstone, stone sand, and poultry grit. Davidson Granite Co. quarried rough and dressed dimension granite, curbing and paving blocks; J. T. Reagan Co. produced curbing and rubble.

**Dougherty.**—Sand, principally for building purposes, totaled 147,000 tons, a decrease of 1 percent. Producers were Albany Lime & Cement Co., Garrett Base Materials Products Co., Musgrove Sand Co., and Quick Service Sand Co.

**Effingham.**—Dawes Silica Mining Co. mined sand at the Eden Pit for building, blast, filter, molding, and other uses.

**Elbert.**—Output of dimension granite was 40,000 tons (482,000 cubic feet) valued at $1.4 million, increasing 4 percent in quantity and about the same in value as in 1955. Ten companies quarried in the vicinity of Elberton and produced monumental stone, exclusively, except for a small quantity of rubble marketed by one company. Rough and dressed stone were produced by Comolli Granite Co., Elbert County Granite Co., and Elberton Granite Industries., Inc. Rough monumental stone only was quarried by American Granite Quarries, Inc., Coggins Granite & Marble Industries, Inc., Continental Granite Co., M. W. Kantala & Sons, Robin Blue Quarries, Inc., and A. G. & M. H. Veal. A small quantity of dressed stone was produced by Elberton City Quarries, Inc. R. V. Venable produced 50,000 tons of crushed granite for concrete and roadstone. Bond Sand & Gravel Co. and Coldwater Sand Co. mined structural and paving sands.

**TABLE 17.—Dimension granite sold or used by producers in Elbert County, 1948–51 (average) and 1952–56**

| Year | Short tons | Cubic feet | Value | Year | Short tons | Cubic feet | Value |
|---|---|---|---|---|---|---|---|
| 1948–51 (average) | 37,958 | 457,325 | $1,348,711 | 1954 | 43,398 | 522,864 | $1,561,490 |
| 1952 | 35,003 | 421,725 | 1,229,813 | 1955 | 38,439 | 463,123 | 1,401,114 |
| 1953 | 39,254 | 472,967 | 1,212,089 | 1956 | 39,993 | 481,846 | 1,399,140 |

**Evans.**—Evans Concrete Products Co. mined sand for building and other uses near Daisy.

**Fannin.**—Campbell Lime & Stone Co. crushed limestone, and Fannin County Highway Department crushed granite for concrete and roadstone.

**Fayette.**—Crushed granite was quarried by Tyrone Rock Products Co. for concrete, roadstone, and railroad ballast.

**Floyd.**—Bauxite was mined by American Cyanamid Co. and manganese ores by Kingman Mines, Inc. Crushed and dimension limestone were quarried by Floyd County Highway Department and crushed limestone for concrete, roadstone, and railroad ballast by Ready-Mix Concrete Co. Oconee Clay Products Co. and Rome Brick Co. mined shale for manufacturing brick and other clay products.

Digitized by Google

**Fulton.**—Clays for manufacturing brick were mined by Atlanta Brick & Tile Co. and Chattahoochee Brick Co. J. D. Jones, C. J. Ross, and Thompson Bros. Sand Co. mined structural sand from pits near Atlanta. Three new granite quarries were opened in the county in 1956. Hitchcock Corp. opened the Bellwood quarry, and Stockbridge Stone Co. operated two portable plants at quarries for producing crushed granite.

**Gilmer.**—Limestone and marble were mined and crushed at Whitestone for agricultural use, aggregates, fillers, roofing, and terrazzo. Willingham-Little Stone Division of Georgia Marble Co. and Marble Products Co. of Georgia were producers in 1956.

**Glascock.**—Harbison-Walker Refractories Co. resumed production of kaolin at the Gibson mine, and General Refractories Co. reported initial output of kaolin from the new Robson mine.

**Glynn.**—Crews Sand Co. and Gray Towing Co. mined building and other sands; both were new producers in 1956.

**Gordon.**—Plainville Brick Co. mined shale for use in its brick plant at Plainville.

**Grady.**—Cairo Production Co. mined and processed fuller's earth; the Milwhite Co. did not operate in 1956.

**Gwinnett.**—Crushed granite for concrete aggregate and roadstone was quarried by the Georgia State Board of Corrections and Stockbridge Stone Co.; the latter produced from a new quarry at Norcross.

**Hancock.**—Weston & Brooker Co. quarried and crushed granite at Granite Hill for concrete and roadstone.

**Haralson.**—Haralson County Highway Department produced a small tonnage of paving sand for its own use.

**Hart.**—Funkhouser Co. mined mica schist from which it separated and ground scrap mica. Betty Mining Co. and Payne Bros. produced sheet mica. Two DMEA contracts aiding exploration of strategic mica were active in 1956. Ernest B. Wood explored the E. B. Wood prospect and John Phillips, the Bray No. 1 prospect; the 2 totaled $12,624; Government participation was 75 percent.

**Henry.**—Stockbridge Stone Co. quarry at Stockbridge produced crushed granite for concrete, roadstone, and railroad ballast.

**Houston.**—Penn-Dixie Cement Co. manufactured portland cement at Clinchfield, using clay and limestone mined by the company nearby. Georgia Limerock Co. produced crushed limestone, principally for agricultural use.

**Jasper.**—Appalachian Minerals Co. mined and beneficiated feldspar rock at its flotation plant near Monticello. Ground quartz was obtained as a byproduct.

**Jefferson.**—Tennessee Absorbent Clay Co. opened a new pit and began producing fuller's earth in September 1956.

**Long.**—Dawes Silica Mining Co. increased production of structural sand from its pit at Ludowici.

**Lowndes.**—Georgia Peat Moss Co. produced peat humus from a bog near Twin Lakes.

**Macon.**—American Cyanamid Co. mined crude bauxite from the Pierce-Norris and Cavender mines in 1956.

**Madison.**—Coggins Granite & Marble Industries, Inc., of Elberton quarried granite, used principally as monumental stone, at the Piedmont quarry near Carlton.

Digitized by Google

**Monroe.**—C. & H. Mines and Spalding Mining Co. produced sheet mica and E. V. Curtis hand-cobbed mica; the entire quantity sold to the Government at the Spruce Pine (N. C.) Purchase Depot.

**Murray.**—Production of crude talc and soapstone was 58,000 tons valued at $122,000—increases of 8 percent in tonnage and 4 percent in value over 1955. Ground talc and soapstone increased 8 percent in tonnage and 7 percent in value. Sawed-material production showed little change from 1955, but its value increased 6 percent. Cohutta Talc Co., Georgia Talc Co., and Southern Talc Co. operated mines east of Chatsworth and sawing and grinding plants in Chatsworth.

**Muscogee.**—The value of mineral production was 20 percent higher than in 1955 owing to increased production of crushed granite by Alabama Aggregates Co. and Columbus Rock Corp. Sand and gravel was mined near Columbus by J. J. Brown Sand & Gravel Co. and Calhoun Sand & Gravel Co.

**Oconee.**—C. F. Thomas mined a small quantity of sheet mica.

**Oglethorpe.**—Output of dimension granite was virtually the same as in 1955, but value increased 13 percent. Bennie & Harvey, Dixie Granite Quarries, Enterprise Granite Co., and Hoover Granite Quarries produced rough monumental stone; Liberty Granite Co. and Oglethorpe Quarrying Co. produced dressed monumental stone.

**TABLE 18.—Dimension granite sold or used by producers in Oglethorpe County, 1952–56**

| Year | Short tons | Cubic feet | Value | Year | Short tons | Cubic feet | Value |
|---|---|---|---|---|---|---|---|
| 1952 | 17,265 | 208,003 | $368,655 | 1955 | 22,196 | 254,307 | $558,627 |
| 1953 | 22,527 | 256,912 | 533,135 | 1956 | 22,266 | 239,168 | 630,121 |
| 1954 | 23,331 | 267,595 | 766,392 | | | | |

**Pickens.**—The total value of mineral production was within 1 percent of that of the previous year, but Pickens County was displaced as second highest in value of mineral production. The Georgia Marble Co. quarries and finishing plants at Tate and Nelson marketed crushed and ground marble and dressed building and monumental stone. Carl Johnson and Hardy Johnson quarried sandstone (flagstone). E. Easterwood mined mica (sericite) from the Martin mine for shipment to the Thompson-Weinman grinding plant at Cartersville.

**Pike.**—McKinley Mica Co. mined hand-cobbed mica from the McKinley mine.

**Polk.**—Mineral production in Polk County increased 35 percent in value from 1955. Cement, slate, and brown iron ore all gained substantially over the preceding year. Marquette Cement Manufacturing Co. produced masonry and portland cement at its plant at Rockmart. Limestone for the plant was obtained from a new quarry in Bartow County; no production from the Polk County quarry was reported. Clays used came from the Rockmart mine. Crushed slate was mined by Georgia Lightweight Aggregate Co. for its plant at Rockmart.

Brown-iron-ore production increased to 123,000 tons valued at $605,000, 71 and 67 percent higher in tonnage and value, respectively, over 1955. Six operators were active in the Cedartown district com-

Digitized by Google

TABLE 19.—Shipments of brown iron ore in Polk County, 1948–51 (average) and 1952–56

| Year | Long tons | Value | Year | Long tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 110,256 | $371,807 | 1954 | 72,635 | $304,682 |
| 1952 | 165,522 | 822,802 | 1955 | 71,808 | 361,773 |
| 1953 | 146,690 | 652,306 | 1956 | 122,518 | 605,109 |

pared with four the previous year. The principal producers were Acree Mining Co., Albea-York Mining Co., Inc., and Graves Mining Co. Others were E. L. Gammage, Frank Ellis, and Jim Hume.

**Rabun.**—J. R. Coffey produced a small tonnage of paving gravel.

**Richmond.**—The total value of mineral production increased 1 percent over 1955. Clay and kaolin output increased considerably; crushed stone and sand and gravel decreased somewhat from 1955. Albion Kaolin Division of Interchemical Corp. mined kaolin for refractories, as well as for pigments and textile uses, at Hepzibah. Georgia-Carolina Brick & Tile Co. and Merry Bros. Brick & Tile Co. produced clay for manufacturing clay products. Superior Stone Co. crushed quartzite at the Dan quarry for concrete and roadstone. Augusta Sand & Gravel Co. (formerly Richmond Sand Co.) and Richmond County Highway Department mined paving sand.

**Screven.**—Atlanta Peat Co., Sylvania, was the only mineral producer in the county.

**Stephens.**—Burkhart Quarry & Supplies, Inc., purchased the Toccoa quarry of Toccoa Construction Co. in October 1956 and continued producing crushed granite for concrete and roadstone.

**Stewart.**—Brown iron ore was mined for the first time in Stewart County in 1956; production totaled 55,000 tons. Seven companies were active; the principal producers were Dunbar & Layton, Price & Jackson Mining Co., and Southern Iron Corp.

**Sumter.**—American Cyanamid Co. reported production of bauxite from the Holloway mine, a new operation in 1956.

**Talbot.**—Brown Bros. and Taylor Sand Co. produced structural and paving sand from pits near Junction City.

**Taylor.**—Howard Sand Co. operated a pit near Howard for producing building and paving sand.

**Telfair.**—Walker Sand Pit north of Lumber City was the only mineral producer in the county.

**Thomas.**—Arnold Brick Co. mined clay for use in its brick plant at Thomasville, and Dawes Silica Mining Co. produced building, blast, filter, glass, molding, and other sands at Thomasville. Waverly Petroleum Products Co. opened a new mine for producing fuller's earth near Meigs.

**Towns.**—A few pounds of corundum was collected near Hiawassee by J. M. Steinoff.

**Troup.**—Mineral Processing Co. recovered beryl at the Hogg mine; G. W. Withers purchased rose quartz mined in Troup County. W. Hugh Allen explored the Word mine for beryl under a DMEA contract of $6,516.

**Twiggs.**—Twiggs County maintained its position as the State's leading mineral-producing county in terms of value. Output of kaolin and fuller's earth increased 9 percent in tonnage and 14 in

Digitized by Google

value. Diversey Corp. mined and processed fuller's earth for absorbents, fillers, and filters; Georgia Coating Clay Co., Georgia Kaolin Co., J. M. Huber Corp., and Southern Clays, Inc., produced kaolin for whiteware, refractories, paper, filler, and other uses.

**TABLE 20.—Kaolin and fuller's earth sold or used by producers in Twiggs County, 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1952 | 521,077 | $7,487,877 | 1955 | 848,565 | $14,331,993 |
| 1953 | 486,371 | (1) | 1956 | 926,931 | 16,365,323 |
| 1954 | 750,441 | 12,543,077 | | | |

[1] Figure withheld to avoid disclosing individual company confidential data.

**Union.**—United States Forest Service produced a small tonnage of paving gravel for its own use.

**Upson.**—Total mica production in 1956 was valued at $135,000. Output by 6 operators came from 12 mines, compared with only 2 producers in 1955. J. & B. Mining Co. (Adams and Mitchell Creek mines) and Southern Mining Co., Inc. (Barron, Lockheart, and Reynolds mines), produced both sheet and hand-cobbed mica; E. H. Schwab (Duke and other mines) and Thompson and Ferdue (Frank Taylor mine) marketed sheet mica only; and Boyt Mining Co. (Boyt mine) mined hand-cobbed mica. Edwin H. Schwab continued exploration for strategic mica under a DMEA contract dated October 6, 1955, for $5,524.

**Walker.**—Production of coal and limestone in 1956 was 30 percent less than in 1955. Coal output by 5 companies was 8,500 tons valued at $42,000, compared with 11,000 tons and $56,000 in 1955. Willard Parker and H. R. Perry Stone Co. quarried dimension limestone near Chickamauga, principally for local residential construction. Dave L. Brown Co. crushed limestone at the Rossville quarry.

**Ware.**—E. W. Pafford dredged sand near Waycross, principally for building purposes.

**Warren.**—Weston & Brooker Co. quarried at Camak and crushed granite for concrete and roadstone, railroad ballast, stone sand, and riprap.

**Washington.**—Kaolin production rose to 316,000 tons valued at $5.3 million, increasing 12 percent and 18 percent in tonnage and value, respectively, above 1955. Washington County ranked second in the State in value of its mineral production and as a kaolin producer. Producers were Godfrey L. Cabot, Inc. (Georgia Pigments Div.), Champion Paper & Fiber Co., Minerals & Chemical Corp. of America, Thiele Kaolin Co., and United Clay Mines Corp. Kaolin was used

**TABLE 21.—Kaolin sold or used by producers in Washington County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 231,924 | $3,400,650 | 1954 | 264,195 | $4,162,386 |
| 1952 | 259,977 | 4,069,357 | 1955 | 282,411 | 4,543,775 |
| 1953 | 302,250 | 4,768,916 | 1956 | 316,296 | 5,344,238 |

Digitized by Google

principally for paper coating and as filler, followed by whiteware and rubber.

**Whitfield.**—Dalton Brick & Tile Co. mined shale for manufacturing clay products at its plant south of Dalton. No limestone production was reported in 1956.

**Wilkinson.**—Wilkinson County ranked fourth in value of its mineral output, which consisted solely of kaolin. Production was 311,000 tons valued at $4.5 million, a 7-percent increase in tonnage and value above 1955. Evans Clay Co., M & M Clays Co., and Minerals & Chemical Corporation of America mined kaolin for paper coating, paper, rubber, and other fillers. Harbison-Walker Refractories Co., D. C. Hardie, and Oconee Clay Products Co. mined refractory kaolin for manufacturing refractory and other clay products.

**TABLE 22.—Kaolin sold or used by producers in Wilkinson County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 358,478 | $5,687,201 | 1954 | 241,198 | $3,692,143 |
| 1952 | 435,528 | 6,639,300 | 1955 | 290,520 | 4,235,741 |
| 1953 | 454,000 | 7,467,181 | 1956 | 310,528 | 4,525,537 |

465877—58——23

Digitized by Google

Digitized by Google

# The Mineral Industry of Hawaii and Pacific-Island Possessions

By L. E. Davis[1]

## HAWAII

THE VALUE of the mineral output in the Territory of Hawaii reached an all-time peak in 1956, increasing more than 90 percent over 1955. Although the increase in value was reflected in all but two of the minerals produced, the stone industry showed the greatest growth. The mineral-industry activities that contributed most to the economy of the islands during the year were quarrying basalt, coral, and coral limestone; preparation of lime and coral, sand and gravel; and production of clays, salt, and volcanic cinder. Despite continued interest in the titanium and aluminum-bearing clays of the Territory, no attempt has yet been made to treat them commercially for their metal content.

**Markets.**—All minerals produced in 1956 were consumed locally and thus contributed appreciably to the Territory's economy. However, civilian and military uses required that substantial quantities of minerals be imported or obtained from continental United States. Included were special construction materials, when locally produced minerals could not meet specifications, and petroleum products, cements, fertilizer materials, natural asphalts, and salt. Many of these minerals were shipped from west coast ports of the United States, and important tonnages of ferrous and nonferrous scrap were shipped to west coast ports from the Territory.

**Employment.**—Employment in the mineral industries recovered from the decline of 1955 and averaged 200 persons in 1956. Employment in 1955 totaled only 177. Earnings increased substantially to an average weekly wage of $72.82 compared with $66.28 in 1955.

[1] Commodity-industry analyst, Region II, Bureau of Mines, San Francisco, Calif.



Digitized by Google

**TABLE 1.—Mineral production in the Territory of Hawaii and Pacific Island possessions, 1955–56** [1]

| Area and mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| American Samoa: | | | | |
| Sand and gravel | 1,275 | $552 | | |
| Stone (crushed) | 9,011 | 3,948 | 2,493 | $6,505 |
| Total | | 4,500 | | 6,505 |
| Canton: Stone (crushed) | 500 | 1,500 | 1,620 | 4,860 |
| Guam: | | | | |
| Sand and gravel | | | 18,668 | 24,437 |
| Stone (crushed) | 1,241,466 | 3,351,958 | 341,072 | 311,248 |
| Total | | 3,351,958 | | 335,685 |
| Territory of Hawaii: | | | | |
| Clays | (2) | (2) | 1,590 | 1,988 |
| Lime | 6,453 | 202,005 | 9,555 | 305,709 |
| Pumice (volcanic cinder) | 130,306 | 75,906 | 58,851 | 91,695 |
| Salt | (2) | (2) | 270 | 18,119 |
| Sand and gravel | 165,081 | 425,760 | 193,149 | 502,692 |
| Stone | 1,414,304 | 2,884,354 | 3,493,717 | 6,076,040 |
| Value of items that cannot be disclosed | | 21,818 | | |
| Total [3] | | 3,592,061 | | 6,971,233 |
| Johnston: Stone (crushed) | 12,090 | 32,550 | | |
| Midway: Stone (crushed) | | | 203,049 | 304,574 |
| Wake: Stone (crushed) | 1,000 | 3,000 | 21,500 | 21,500 |

[1] Supplemental production data for American Samoa furnished by the Government of American Samoa; Canton and Wake by the U. S. Department of Commerce, Civil Aeronautics Administration; Guam by the Government of Guam; Midway by the U. S. Department of the Navy.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total has been adjusted to eliminate duplicating the value of limestone used in lime.

# REVIEW OF MINERAL COMMODITIES

## NONMETALS

**Clays.**—Production of miscellaneous clay in 1956 was confined to the island of Oahu. Most of the output was used in heavy clay products; a small tonnage was consigned to pottery and stoneware manufacture. The producers were Gaspro, Ltd., and Wilsonite Brick Co., Ltd. The clays of the Territory are not well adapted to structural clay products, porcelain, or refractories, as they shrink excessively on drying and crack when fired. In the future any increased output of clay may be used only as an admixture with other and better clays.

**Lime.**—Lime was produced in the kiln and hydrator operated by Gaspro, Ltd,. at Honolulu from limestone quarried by the company on Oahu. Most of the output of the plant was hydrated lime; only a few tons of quicklime was produced for the building trades. Approximately 25 percent of the output of hydrated lime also was sold to the building trades, the remainder being used for chemical and other industrial purposes. The carbon dioxide byproduct of the kiln operation was converted to "dry ice." The local demand for lime in 1956 was on a par with that in previous years, and the kiln was operated at near capacity. The price of lime increased slightly after an increase in wages.

Digitized by Google

**Pumice (Volcanic Cinder).**—The only production of volcanic ash and cinder in the Territory in 1956 was on the island of Hawaii. Three sugar companies quarried pumice for use in maintaining company roads.

**Salt.**—Salt was recovered from sea water by solar evaporation. This product, used largely in processing certain special foods, was in light demand, and only a small tonnage (a few tons less than in 1955) was produced. Chum Mew Ting Co. was the only producer in the Territory.

**Sand and Gravel.**—On the island of Hawaii, Corps Construction, Ltd., produced gravel near Kamuela for the Hawaiian Irrigation Authority; Hawaii Trucking Co., Ltd., prepared paving gravel for the National Guard Reservation at Hilo; Honolulu Builders, Ltd., operated the Hue Hue quarry and prepared building sand and gravel which was sold to the Territory highway department, the county of Hawaii, various building contractors, farmers, and others; and J. M. Tanaka operated a fixed plant near Kona and produced building sand and paving sand and gravel for several contractors, the county of Hawaii, and the Territorial Government. In the Kilauea area of the Hawaiian National Park, the National Park Service prepared building sand and gravel for its own use. On the island of Oahu, Chang's Express produced building sand for the board of water supply, the United States Air Force, and the United States Department of Agriculture; and coral beach sand was prepared by Honolulu Construction & Draying Co., Ltd., near Kailua, and by Pacific Concrete & Rock Co., Ltd., near Waialua, for Federal military agencies and for the Honolulu county and city governments. The Clarke-Halawa Rock Co., Ltd., produced pit-run sand under a subcontract for the Corps of Engineers.

**Stone.**—*Basalt.*—The substantial increase in basalt production in the Territory in 1956 was due primarily to increased demand for basalt for use at the National Guard Recreation Area on the Island of Hawaii. James W. Glover, Ltd., also produced considerable basalt for local contractors near Hilo who used it in road building and paving. Other producers of basalt on Hawaii were Honolulu Builders, Ltd., the Hawaii County engineer, and the National Park Service. Increased requirements by the Pearl Harbor naval shipyard, which were supplied by Honolulu Construction & Draying Co., Ltd., resulted in a larger output in Honolulu County. Production and requirements of basalt on the Islands of Kauai and Maui remaind substantially the same as in 1955.

*Limestone.*—Production of limestone in the Territory increased notably in 1956. Virtually all of the increase was made by Gaspro, Ltd., which produced an appreciable tonnage of the crushed material for land fill as a road base. This company also quarried a slightly larger tonnage of limestone for use in making lime in its kiln at Honolulu. Other major producers of crushed limestone in Honolulu County were Kailua Limestone Co. and Nanakuli Paving & Rock Co., which produced the material for concrete and road metal. Kailua Limestone Co. also prepared a small tonnage of the stone for use as rubble. The only other major limestone producer was Grove Farm Co., Ltd., on the island of Kauai. A small part of their output was consigned to agricultural use.

Digitized by Google

*Miscellaneous Stone.*—Although only a token tonnage of coral stone was quarried in Hawaii County for concrete and road metal, an important tonnage was produced for the Department of the Navy in Honolulu County by the Hawaiian Dredging & Construction Co., Ltd. The stone was stockpiled for use as rough fill and concrete aggregate. No other production was reported in the Territory.

**Vermiculite.**—A small tonnage of crude vermiculite was exfoliated by Vermiculite of Hawaii, Ltd., at its Honolulu County plant. The crude material was obtained from the Western United States. The increase in cost due to freight charges resulted in a higher unit retail value for the prepared vermiculite. The expanded material was used for plaster aggregate, acoustical and thermal insulation, and agriculture.

## PACIFIC-ISLAND POSSESSIONS

**American Samoa.**—Basalt was quarried and crushed for concrete aggregate by the Government of American Samoa. A small tonnage of coral was dredged and prepared for use in surfacing roads.

**Canton.**—Several hundred tons of coral was produced and prepared by a contractor for the Civil Aeronautics Administration for use in surfacing airport runways.

**Guam.**—Contractors for the Public Works Department, Government of Guam, and the Department of Defense quarried and prepared coral limestone for use as concrete aggregate in building and road paving. F. D. Perez & Bros. Co., one contractor, also produced coral stone for use as riprap by local purchasers.

**Midway.**—The Hawaiian Dredging & Construction Co., Ltd., produced a considerable tonnage of coral, which was used as concrete aggregate and for road maintenance.

**Wake.**—A contractor for the Civil Aeronautics Administration prepared several thousand tons of crushed coral for use in airport-runway paving.

Digitized by Google

# The Mineral Industry of Idaho

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the State of Idaho Bureau of Mines and Geology.

By Kenneth D. Baber,[1] Frank B. Fulkerson,[1] Norman S. Petersen [1] and Albert J. Kauffman, Jr.[2]

VALUE of mineral production in Idaho increased $6.7 million in 1956—the first substantial gain in 4 years. However, the $75.2 million total value was well below that in 1948 and again in 1950–52. Copper output advanced $1.5 million and made the largest single contribution among the metals to the rise in the State total. The combined value of lead and zinc also gained $1.5 million, owing to higher metal prices. Silver output declined slightly. These 4 metals supplied 69 percent of the State value. Production of cobalt reached a record total, and mercury also advanced considerably, while output of tungsten ore decreased sharply.

In nonmetals, gains in value for phosphate rock, sand and gravel, and stone totaled $3.1 million; moderate increases were made by

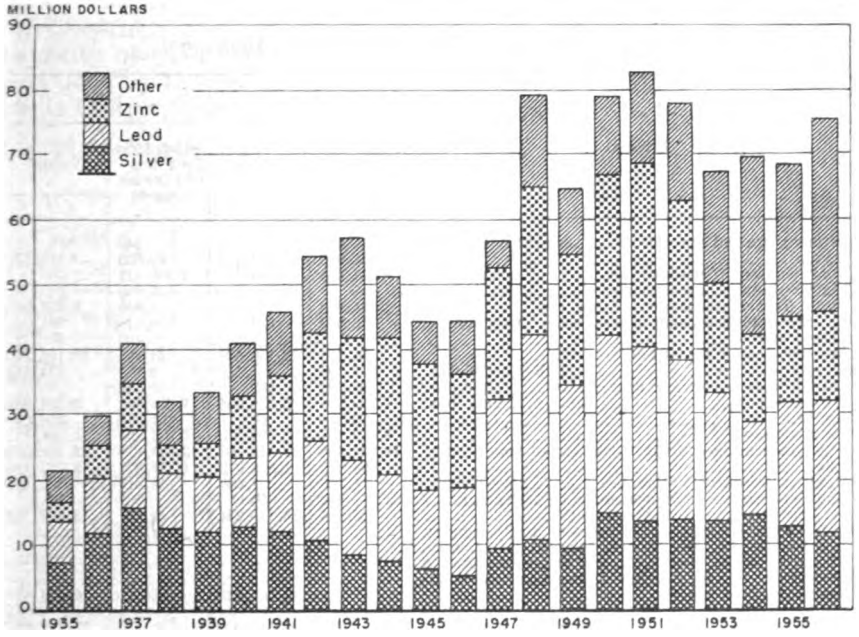



FIGURE 1.—Value of silver, lead, and zinc and total value of mineral production in Idaho, 1935–56.

[1] Commodity-industry analyst, Region I, Bureau of Mines, Albany, Oreg.
[2] Chief, Division of Mineral Industries, Region I, Bureau of Mines, Albany, Oreg.



Digitized by Google

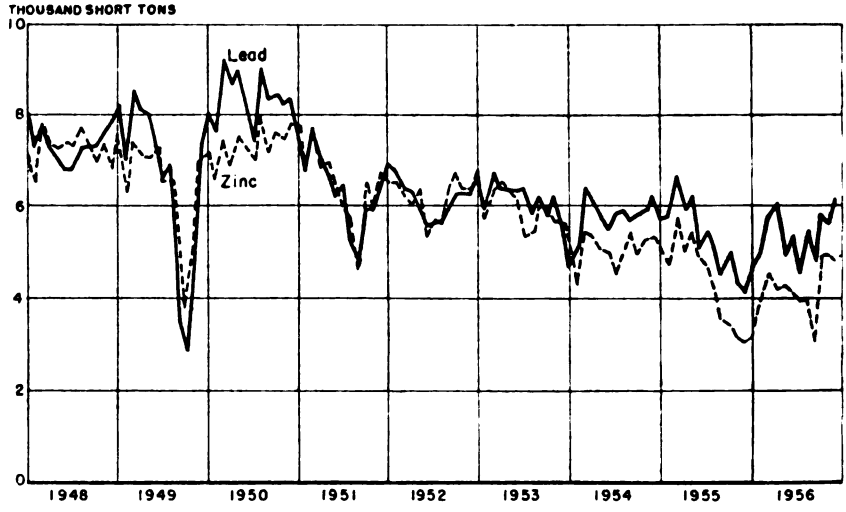



FIGURE 2.—Mine production of lead and zinc in Idaho, 1948–56, by months in terms of recoverable metals.

barite and pumice and pumicite; and a decline was recorded for cement. The continued increase in phosphate-rock mining resulted from activation of a new mine, as well as increased tonnage from one of the established operations.

**TABLE 1.—Mineral production in Idaho, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Antimony ore and concentrate.....antimony content.. | 633 | (2) | 549 | (2) |
| Clays | 35,003 | $29,910 | [3] 22,620 | [3] $13,425 |
| Cobalt (content of concentrate).....pounds.. | 1,691,334 | (2) | 2,385,013 | (2) |
| Columbium-tantalum concentrate.....do.... | (2) | (2) | 215,900 | (2) |
| Copper (recoverable content of ores, etc.)..... | 5,618 | 4,191,028 | 6,656 | 5,657,600 |
| Gold (recoverable content of ores, etc.)....troy ounces.. | 10,572 | 370,020 | 10,029 | 351,015 |
| Iron ore (usable)..... | ---------- | ---------- | 800 | (2) |
| Lead (recoverable content of ores, etc.)..... | 64,163 | 19,120,574 | 64,321 | 20,196,794 |
| Mercury.....76-pound flasks.. | 1,107 | 321,417 | 3,394 | 882,168 |
| Nickel (content of ore and concentrate).....pounds.. | 65,782 | (2) | 98,495 | (2) |
| Phosphate rock.....long tons.. | 1,329,959 | 6,038,088 | 1,438,151 | 6,539,436 |
| Pumice..... | (2) | (2) | 101,913 | 206,064 |
| Sand and gravel..... | 8,652,138 | 3,933,876 | 7,874,460 | 5,661,417 |
| Silver (recoverable content of ores, etc.)....troy ounces.. | 13,831,458 | 12,518,168 | 13,471,916 | 12,192,764 |
| Stone..... | 1,524,810 | 1,866,076 | 1,791,077 | 2,752,148 |
| Titanium concentrate (ilmenite).....gross weight.. | 1,330 | 7,000 | 48,619 | 260,460 |
| Tungsten concentrate (60-percent $WO_3$ basis)..... | 642 | (2) | 582 | (2) |
| Zinc (recoverable content of ores, etc.)..... | 53,314 | 13,115,244 | 49,561 | 13,579,714 |
| Value of items that cannot be disclosed: Barite, cement, abrasive garnet, gem stones, gypsum (1955), mica (1955), monazite, peat (1955), and values indicated by footnote 2. Excludes value of limestone used in the manufacture of cement..... | ---------- | 7,001,832 | ---------- | 6,885,376 |
| Total..... | ---------- | 68,513,000 | ---------- | 75,178,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originated in Idaho cannot be credited owing to lack of information (see last paragraph of introduction).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Incomplete total—fire clay included with items that cannot be disclosed.

Digitized by Google

The total quantity of lead and zinc recovered decreased 3,600 tons, despite settlement of a major strike and an increase in metal prices. The number of operations mining lead and lead-zinc ores dropped from 58 in 1955 to 55 in 1956, and announcement was made late in the year that a large mine—the Frisco—was to be closed in January 1957.

**Trends and Markets.**—Average weighted prices per pound of all grades of refined metal sold in 1956 as compared with 1955 were as follows (1955 prices in parentheses): Copper, $0.425 ($0.373); lead, $0.157 ($0.149); and zinc, $0.137 ($0.123). The demand for lead continued, but the market for zinc weakened in midyear and continued Government purchases for the national stockpile prevented a price decline. Output of tungsten ore and concentrate was affected adversely by decreased Government purchases for the national stockpile, as well as the reduced purchase prices for this material. Mercury production responded to comparatively high and stable price.

Sand and gravel and stone production benefited from increased construction activity. The largest projects under way, besides the highway-building program, were the Bureau of Reclamation Palisades Dam on the upper Snake River, Brownlee Dam in Hells Canyon of the Snake River, and expansion of the Atomic Energy Commission (AEC) test site at Arco. Employment at the Palisades project totaled 475 at the summer peak—a decline from the year-ago total, as the dam neared completion. Idaho Power Co. completed the diversion tunnel at the Brownlee Dam, and excavation for the base of the project also was completed. Employment totaled 850 at year's end. The Brownlee project was the first of three dams that were to be constructed in Hells Canyon by Idaho Power Co. Estimated capacity of the 3 projects was 800,000 kilowatts. Preliminary work was done by the company at the Oxbow site in 1956, and work at the Hells Canyon site was not yet begun. Construction was in progress

**TABLE 2.—Employment and wages in mining and mineral manufacturing, 1947–51 (average) and 1952–56, by industries [1]**

| Year | Mining | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Metals | | Nonmetals | | Fuels | | Total | |
| 1947–51 (average) | 5,250 | $19,907,092 | 242 | $790,354 | 14 | $33,548 | 5,506 | $20,730,994 |
| 1952 | 5,231 | 24,580,580 | 307 | 1,327,175 | 24 | 153,642 | 5,562 | 26,061,397 |
| 1953 | 4,479 | 21,835,855 | 326 | 1,374,802 | 14 | 27,223 | 4,819 | 23,237,880 |
| 1954 | 4,206 | 19,753,622 | 283 | 1,204,006 | 9 | 11,790 | 4,498 | 20,969,418 |
| 1955 | 4,112 | 20,012,050 | 297 | 1,333,588 | 28 | 88,054 | 4,437 | 21,433,692 |
| 1956 | 4,498 | 23,161,247 | 268 | 1,210,320 | 26 | 94,146 | 4,792 | 24,465,713 |

| Year | Mineral manufacturing | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone and clay products | | Primary metals | | Chemicals and allied products | | Total | |
| 1947–51 (average) | 364 | $1,114,223 | 1,003 | $3,843,553 | 212 | $814,708 | 1,579 | $5,772,484 |
| 1952 | 406 | 1,484,672 | 1,097 | 5,382,504 | 1,054 | 4,774,938 | 2,557 | 11,642,114 |
| 1953 | 391 | 1,524,228 | 1,041 | 4,800,556 | 757 | 3,372,287 | 2,189 | 9,697,071 |
| 1954 | 385 | 1,499,787 | 1,147 | 5,214,121 | 796 | 3,614,231 | 2,328 | 10,328,139 |
| 1955 | 427 | 1,690,725 | 1,120 | 5,408,913 | 797 | 3,993,813 | 2,344 | 11,093,451 |
| 1956 | 458 | 1,894,254 | 1,173 | 6,398,533 | 877 | 4,655,156 | 2,508 | 12,947,943 |

[1] Employment covered by Idaho Employment Security Act; compiled from State employment security agency tabulations.

Digitized by Google

on new buildings and roadways at the AEC facility at Arco under an expansion program that would cost $15 million. Government operating personnel at the end of the year totaled 2,700, not including construction crews.

Average employment by construction contractors in Idaho totaled 9,000, as compared with 8,600 in 1955. Increased commercial and industrial construction was reported. The value of building permits authorized by municipalities totaled $39.6 million, compared with $36.5 million in 1955.

In connection with the new highway program authorized by the 1956 Federal Highway Act, estimated Federal grants to Idaho during the period 1957–70 will total $364 million. The National Crushed Stone Association estimated that the tonnage of mineral aggregate needed for the Federal Highway Program in Idaho from 1957 to 1959 would exceed normal requirements by the following: 1957, 5.5 million tons; 1958, 6.3 million tons; 1959, 7 million tons.[3]

**Employment and Wages.**—In the 10 years 1947–56 the number of workers in the mining industry varied from a high of 5,700 in 1947 to a low of 4,400 in 1955. The 1956 average was 4,800. In January mining employment averaged only 4,200 but increased to 4,600 in February, following settlement of a labor dispute. For the rest of the year employment followed an upward trend to reach 5,000 in December. Over 70 percent of the employment was in Shoshone County. Payrolls totaled $24.5 million, compared with $21.4 million in 1955. Average weekly earnings of production workers (excluding supervisory and administrative personnel) were $97.11 compared with $89.69 in 1955. A drop from $100.49 in January to $95.63 in February was attributed to the hiring of extra workers following settlement of a labor dispute. Average weekly earnings reached a high of $102 in December.

Average weekly hours gained from 40.4 in 1955 to 41.5 in 1956, and average hourly earnings were up 12 cents to $2.34. Employment in mineral manufacturing reached 2,500, highest since 1952, and payrolls totaled $13 million, compared with $11.1 million in 1955.

**Defense Minerals Exploration Administration.**—The program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial participation by the Government was repayable from royalties on ore discovered and subsequently mined.

In addition to the mineral values credited to Idaho in table 1, some have been omitted owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium selenium, tellurium, gallium, and germanium. The quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues obtained from refining such metals as copper and lead and those obtained in other ways.

It is not possible in many such instances to distribute the mineral product by States of origin, and sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value, the production of which seldom can be separated as to source, is byproduct sulfuric acid.

[3] Rock Products, vol. 60, No. 1, January 1957, pp. 78–79.

Digitized by Google

TABLE 3.—Defense Minerals Exploration Administration contracts active during 1956

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total amount | Government participation, percent |
| BLAINE | | | | | |
| Silver Star-Queens Mines, Inc. | Queen of the Hills | Lead, zinc | Apr. 25, 1955 | $235,780 | 50 |
| Triumph Mining Co | Triumph | do | Aug. 9, 1954 | 143,354 | 50 |
| BONNER | | | | | |
| Whitedelf Mining & Development Co. | Whitedelf | Lead | Oct. 19, 1951 | 232,950 | 50 |
| BUTTE | | | | | |
| Ralph M. Taylor et al | Copper mountain | Copper, lead | Oct. 13, 1955 | 14,250 | 50 |
| CUSTER | | | | | |
| Highland-Surprise Consolidated Mining Co. | Deer Trail | Lead, zinc | June 17, 1955 | [1] 67,840 | 50 |
| Alfred G. Hoyl & Associates. | The Meadows | Monazite, thorium | Sept. 20, 1956 | 26,986 | 75 |
| Idaho Custer Silver-Lead Mines, Inc. | Livingston | Lead, zinc | July 28, 1953 | [1] 95,500 | 50 |
| Salmon River Scheelite Corp. | Tungsten Jim | Tungsten | Apr. 21, 1955 | 39,040 | 75 |
| Seagraves Mining Co | Seagraves | Lead, zinc | Oct. 11, 1956 | 9,960 | 50 |
| Fred and Earl Shirts | Mountain King | do | Oct. 8, 1954 | 31,305 | 50 |
| LEMHI | | | | | |
| Bitterroot Uranium, Inc. | Surprise | Uranium | Sept. 28, 1954 | 34,175 | 75 |
| Bradley Mining Co | Ima | Tungsten | Oct. 28, 1952 | [1] 224,400 | 75 |
| Calera Mining Co | Blackbird | Cobalt, copper | Dec. 9, 1953 | 407,340 | 70 |
| Idaho Consolidated Mines, Inc. | Twin Peaks | Lead, zinc | Nov. 10, 1955 | 17,370 | 50 |
| Idaho Metallurgical Industries, Inc. | Tinkers Pride | Cobalt, copper | Aug. 26, 1955 | [1] 345,558 | 62½ |
| Montana Coal & Iron Co. | Black Pine | Copper | Mar. 25, 1955 | 125,050 | 50 |
| Northfield Mines, Inc. | Stevenson | Cobalt, copper | June 2, 1952 | 233,150 | 70 |
| Roger Pierce | Gilmore | Lead, zinc | June 29, 1956 | 82,366 | 50 |
| SHOSHONE | | | | | |
| Bunker Hill Co | Crescent | Lead, zinc, copper | Feb. 25, 1953 | 1,098,750 | 50 |
| Day Mines, Inc | Hercules | Lead, zinc | Dec. 6, 1956 | 415,250 | 50 |
| Hecla Mining Co | Silver Mountain | Lead, zinc, copper | Oct. 21, 1954 | 1,058,370 | 50 |
| Polaris Mining Co | Polaris East Exploration. | Copper, lead, antimony, silver. | June 3, 1953 | [1] 727,390 | 50 |
| Sidney Mining Co | Sidney | Lead, zinc | July 3, 1952 | 523,440 | 50 |
| Silver Buckle Mining Co. | Vindicator | do | Oct. 12, 1953 | 229,500 | 50 |
| Sunset Mines, Inc. | Liberal King | do | Nov. 22, 1954 | 101,125 | 50 |

[1] Amended.

# REVIEW BY MINERAL COMMODITIES

## METALS

**Antimony.**—Sunshine Mining Co., the Nation's only substantial domestic source of antimony in 1956, produced 1.1 million pounds (contained antimony) of electrolytic antimony metal during the year, compared with 1.3 million pounds in 1955 and 1.5 million pounds in 1954. The quantity of material in the company stockpile (3.4 million pounds at the beginning of 1956) declined, however, as a result of large shipments to the reactivated Bradley Mining Co. antimony smelter at Stibnite. The first shipment—a trial lot of 106,000 pounds—was made in October 1955. Subsequently, in June 1956, a contract with Bradley Mining Co. was signed providing for sale of

Digitized by Google

the accumulated stockpile of cathode metal (approximately 2,000 tons) and shipment of the metal was nearly completed by the end of the year.

Refined antimony from the Bradley smelter was sold to the Government under contract. The success of concurrent Sunshine operations at its own pilot plant designed to eliminate arsenic, the chief impurity in the cathode metal, led to the decision to add a refining furnace, pelletizing equipment, and casting furnace to raise daily capacity to 6,000 pounds. Upon completion of the plant, it was expected that current production could be treated and marketed as Grade B metallic antimony under a Government purchase contract.

Negotiation of a contract to supply refined antimony to the Nation's strategic stockpile was under way during the year. The process involved mixing the cathode metal with flake sodium hydroxide and heating in an electric furnace, followed by water leaching of soluble impurities.

Cathode antimony metal produced by Sunshine was obtained by leaching a high-antimony concentrate, produced from ore from the Sunshine mine and adjoining properties operated by Sunshine on a profit-sharing basis, and subsequent electrolysis of the leach solution. The electrolytic plant, reactivated in April 1953, produced metal containing over 95 percent antimony.

Bradley Mining Co. announced in June that the crushing and concentrating plants at its antimony smelter at Stibnite were to be dismantled and sold. The smelter at the site was reactivated simultaneously to process impure electrolytic antimony metal purchased from Sunshine Mining Co. The facility, which was closed in mid-1952 owing to antimony-marketing conditions, produced a large part of national requirements during the high-demand emergency periods in World War II and the Korean War.

Antimony contained in ores from mines out-of-State as well as within the State was recovered and marketed as antimonial lead at The Bunker Hill Co. smelter at Kellogg.

**Cadmium.**—The Bunker Hill Co. lead smelter and the company electrolytic zinc plant, both at Kellogg, Shoshone County, recovered byproduct cadmium from domestic and foreign ores. Electrolytic cadmium from the electrolytic zinc plant in 1956 totaled 467,091 pounds compared with 463,356 pounds in 1955, according to the company annual report.

**Cobalt.**—Resolution of major technical operating problems at the Calera Mining Co. cobalt refinery at Garfield, Utah, permitted substantially increased output from the plant. As a result of the consequent increased requirement for cobalt concentrate, activity at the company Blackbird mine and mill at Cobalt, Lemhi County, was stepped up, and output for the year totaled 2.4 million pounds (cobalt content of concentrate)—a 41-percent increase over 1955. This was well over 60 percent of the total domestic production, ranking Idaho first among the States as a supplier of this strategic metal. The company reported difficulty in obtaining adequate personnel for full-scale operations at the mine during the year.

Successful pilot-plant production of electrolytic cobalt at the Calera Garfield refinery resulted in a decision to proceed with construction of a plant to handle all refinery output. The electrolytic step would replace the final or reduction step of the original process, in which a granular cobalt of lower grade was produced. Cost of the new

Digitized by Google

unit, to be completed late in 1957, was estimated at about $750,000. The Garfield refinery was built for Calera by the Chemical Construction Co. and operated by that company in most of 1954 and 1955, owing to process difficulties encountered. Calera resumed operation of the refinery December 8, 1955.

Articles [4] dealing with mining and milling ore from the Blackbird mine and with processes employed at the Garfield refinery were published during the year.

**Copper.**—Production records revealed a steadily increasing trend in copper output for Idaho; in 1956 the total of 6,656 tons was over 18 percent above the 1955 level. Copper-cobalt ore extracted from the Calera Mining Co. Blackbird mine, Lemhi County, provided half of the total reported for the State. Substantial tonnages were recovered at the Galena, Sunshine, and Silver Summit silver mines, Shoshone County; byproduct copper also was recovered at several large lead-zinc mines.

A number of small mines and prospects were active during 1956. At the old Empire Copper workings in Custer County, operated by Idaho Alta Metals Corp., production of copper ore during the course of development was reported. A $10,000 blaze interrupted work on the 1,000-level ore body and necessitated replacement of a compressor house and machinery. Lucky Scarlet Uranium Mining & Development Co. of Spokane, Wash., purchased the old Dewey, Delman, and Copper Queen groups of mining claims in Idaho County. Both open-pit and underground operations were planned.

**TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1863–1956, in terms of recoverable metals [1]**

| Year | Mines producing | | Material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 172 | 77 | 3,462,325 | 65,196 | $2,281,867 | 12,538,391 | $11,347,772 |
| 1952 | 132 | 29 | 3,008,230 | 32,997 | 1,154,895 | 14,923,165 | 13,506,218 |
| 1953 | 114 | 34 | 2,090,185 | 17,630 | 617,050 | 14,639,710 | 13,249,704 |
| 1954 | 101 | 23 | 1,960,962 | 13,245 | 463,575 | 15,867,414 | 14,360,811 |
| 1955 | 109 | 34 | 1,960,816 | 10,572 | 370,020 | 13,831,458 | 12,518,168 |
| 1956 | 104 | 21 | 2,071,451 | 10,029 | 351,015 | 13,471,916 | 12,192,764 |
| 1863–1956 [3] | ------- | ------- | 133,101,267 | 8,251,203 | 191,931,508 | 655,911,058 | 481,598,519 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 1,794 | $776,428 | 84,705 | $26,608,511 | 82,380 | $23,086,433 | $64,101,011 |
| 1952 | 3,213 | 1,555,092 | 73,719 | 23,737,518 | 74,317 | 24,673,244 | 64,626,967 |
| 1953 | 3,136 | 1,800,064 | 74,610 | 19,547,820 | 72,153 | 16,595,190 | 51,809,828 |
| 1954 | 4,828 | 2,848,520 | 69,302 | 18,988,748 | 61,528 | 13,290,048 | 49,951,702 |
| 1955 | 5,618 | 4,191,028 | 64,163 | 19,120,574 | 53,314 | 13,115,244 | 49,315,034 |
| 1956 | 6,656 | 5,657,600 | 64,321 | 20,196,794 | 49,561 | 13,579,714 | 51,977,887 |
| 1863–1956 [3] | 140,207 | 52,891,523 | 6,710,024 | 890,512,278 | 2,016,447 | 407,914,229 | 2,024,848,057 |

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings and old slag re-treated, and ore shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Partly estimated for years before 1901.

[4] Douglas, E. B., Mining and Milling of Cobalt Ore: Min. Eng., vol. 8, No. 3, March 1956, pp. 280–283. Mitchell, J. S., Pressure Leaching and Reduction at the Garfield Refinery: Min. Eng. vol. 8, No. 11. November 1956, pp. 1093–1095.

Digitized by Google

**TABLE 5.—Gold produced at placer mines, 1947–51 (average) and 1952–56, by classes of mines and methods of recovery**

| Class and method | Mines producing [1] | Material treated (cubic yards) | Gold recovered | | |
|---|---|---|---|---|---|
| | | | Fine ounces | Value | Average value per cubic yard |
| Surface placers: | | | | | |
| Gravel mechanically handled: | | | | | |
| Bucketline dredges: | | | | | |
| 1947–51 (average) | 5 | 2,517,519 | 12,706 | $444,703 | $0.177 |
| 1952 | 3 | 458,150 | 2,359 | 82,565 | .180 |
| 1953 | 2 | 904,000 | 3,865 | 135,275 | .150 |
| 1954 | [2] 3 | 904,300 | 4,832 | 169,120 | .187 |
| 1955 | [2] 2 | 434,000 | 3,149 | 110,215 | .254 |
| 1956 | 1 | 319,848 | 2,125 | 74,375 | .233 |
| Dragline dredges: | | | | | |
| 1947–51 (average) | 3 | 363,200 | 1,639 | 57,372 | .158 |
| 1952 | 6 | 435,000 | 1,769 | 61,915 | .142 |
| 1953 | 4 | 332,000 | 1,476 | 51,660 | .156 |
| 1954 | 2 | 289,000 | 1,308 | 45,780 | .158 |
| 1955 | 4 | 63,900 | 285 | 9,975 | .156 |
| 1956 | 2 | 3,000 | 52 | 1,820 | .607 |
| Suction dredges: | | | | | |
| 1947–51 (average) | 2 | 6,611 | 38 | 1,344 | .203 |
| 1952–56 | | | | | |
| Nonfloating washing plants: [3] | | | | | |
| 1947–51 (average) | 5 | 273,335 | 2,237 | 78,288 | .286 |
| 1952 | | | | | |
| 1953 | 2 | 16,200 | 46 | 1,610 | .100 |
| 1954 | 4 | 26,100 | 292 | 10,220 | .392 |
| 1955 | 3 | 21,200 | 141 | 4,935 | .233 |
| 1956 | 3 | 25,340 | 209 | 7,315 | .289 |
| Gravel hydraulically handled: | | | | | |
| 1947–51 (average) | 7 | 26,859 | 163 | 5,691 | .212 |
| 1952 | 5 | 10,100 | 101 | 3,535 | .350 |
| 1953 | 9 | 181,250 | 425 | 14,875 | .082 |
| 1954 | 7 | 15,800 | 193 | 6,755 | .428 |
| 1955 | 13 | 27,300 | 283 | 9,905 | .363 |
| 1956 | 7 | 1,340 | 98 | 3,430 | 2.560 |
| Small-scale hand methods: [4] | | | | | |
| 1947–51 (average) | 51 | 13,370 | 216 | 7,553 | .565 |
| 1952 | 15 | 2,900 | 92 | 3,220 | 1.110 |
| 1953 | 17 | 2,800 | 75 | 2,625 | .937 |
| 1954 | 7 | 2,900 | 68 | 2,380 | .820 |
| 1955 | 12 | 5,550 | 88 | 3,080 | .555 |
| 1956 | 8 | 2,450 | 38 | 1,330 | .543 |
| Underground placers (drift): | | | | | |
| 1947–51 (average) | 3 | 857 | 10 | 336 | .392 |
| 1952–56 | | | | | |
| Grand total placers: | | | | | |
| 1947–51 (average) | 76 | 3,201,751 | 17,009 | 595,287 | .186 |
| 1952 | 29 | 906,150 | 4,321 | 151,235 | .167 |
| 1953 | 34 | 1,436,250 | 5,887 | 206,045 | .143 |
| 1954 | 23 | 1,238,100 | 6,693 | 234,255 | .189 |
| 1955 | 34 | 551,950 | 3,946 | 138,110 | .250 |
| 1956 | 21 | 351,978 | 2,522 | 88,270 | .251 |

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Includes monazite dredge recovering gold as byproduct.
[3] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[4] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Idaho.

Digitized by Google

**TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals**

| County | Mines producing | | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|
| | Lode | Placer | Fine ounces | Value | Fine ounces | Value |
| Blaine | 10 | ---- | 183 | $6,405 | 383,732 | $347,297 |
| Boise | 1 | 4 | 15 | 525 | 5 | 5 |
| Bonner | 6 | ---- | 180 | 6,300 | 65,517 | 59,296 |
| Custer | 11 | 1 | 184 | 6,440 | 190,245 | 172,181 |
| Elmore | 5 | 1 | 1,392 | 48,720 | 8,782 | 7,947 |
| Gem | 1 | ---- | 13 | 455 | 143 | 129 |
| Idaho | 3 | 7 | 2,440 | 85,400 | 507 | 459 |
| Latah | ---- | 1 | 4 | 140 | ---- | ---- |
| Lemhi | 15 | 1 | 2,767 | 96,845 | 142,603 | 129,063 |
| Shoshone | 36 | 2 | 2,782 | 97,370 | 12,663,214 | 11,460,848 |
| Undistributed [1] | 16 | 4 | 69 | 2,415 | 17,168 | 15,539 |
| Total | 104 | 21 | 10,029 | 351,015 | 13,471,916 | 12,192,764 |

| County | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| Blaine | ---- | ---- | 2,159 | $677,926 | 1,553 | $425,522 | $1,457,150 |
| Boise | ---- | ---- | ---- | ---- | ---- | ---- | 530 |
| Bonner | 2 | $1,700 | 74 | 23,236 | 9 | 2,466 | 92,998 |
| Custer | 32 | 27,200 | 1,646 | 516,844 | 1,203 | 329,622 | 1,052,287 |
| Elmore | ---- | ---- | ---- | ---- | ---- | ---- | 56,667 |
| Gem | ---- | ---- | ---- | ---- | ---- | ---- | 584 |
| Idaho | ---- | ---- | ---- | ---- | ---- | ---- | 85,859 |
| Latah | ---- | ---- | ---- | ---- | ---- | ---- | 140 |
| Lemhi | 3,696 | 3,141,600 | 171 | 53,694 | 16 | 4,384 | 3,425,586 |
| Shoshone | 2,889 | 2,455,650 | 60,221 | 18,909,394 | 46,738 | 12,806,212 | 45,729,474 |
| Undistributed [1] | 37 | 31,450 | 50 | 15,700 | 42 | 11,508 | 76,612 |
| Total | 6,656 | 5,657,600 | 64,321 | 20,196,794 | 49,561 | 13,579,714 | 51,977,887 |

[1] Includes values and quantities that cannot be shown separately for Ada, Adams, Bannock, Boundary, Butte, Camas, Cassia, Clark, Clearwater, Jerome, Kootenai, Owyhee, and Valley Counties.

**TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 440 | 995,194 | 490 | 4,762 | 3,108 |
| February | 790 | 1,118,010 | 539 | 5,046 | 3,880 |
| March | 380 | 1,090,358 | 549 | 5,846 | 4,582 |
| April | 690 | 1,246,570 | 607 | 6,075 | 4,177 |
| May | 970 | 1,028,699 | 556 | 4,941 | 4,202 |
| June | 920 | 1,081,075 | 550 | 5,309 | 4,095 |
| July | 960 | 982,054 | 512 | 4,546 | 3,896 |
| August | 1,020 | 1,213,421 | 625 | 5,441 | 3,930 |
| September | 970 | 963,438 | 624 | 4,769 | 3,033 |
| October | 872 | 1,224,287 | 476 | 5,810 | 4,891 |
| November | 1,115 | 1,254,383 | 547 | 5,615 | 4,941 |
| December | 902 | 1,274,427 | 581 | 6,161 | 4,826 |
| Total | 10,029 | 13,471,916 | 6,656 | 64,321 | 49,561 |

Digitized by Google

**TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals**

| Source | Number of mines[1] | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Ore: | | | | | | | |
| Dry gold | 10 | 312 | 99 | 105 | 700 | | |
| Dry gold-silver | 7 | 9,634 | 1,526 | 40,424 | | 30,000 | |
| Dry silver | 12 | 342,753 | 1,464 | 8,787,227 | 5,081,900 | 4,828,100 | 331,600 |
| Total | 29 | 352,699 | 3,089 | 8,827,756 | 5,082,600 | 4,858,100 | 331,600 |
| Copper | 10 | 276,561 | 2,463 | 7,993 | 6,933,300 | 5,400 | |
| Copper-lead [2] | 1 | (3) | 24 | 133,326 | 197,800 | 289,400 | |
| Lead | 26 | 62,836 | 43 | 192,361 | 17,200 | 5,390,000 | 239,700 |
| Lead-zinc | 29 | 1,187,344 | 1,577 | 4,207,736 | 779,400 | 113,145,500 | 85,952,700 |
| Zinc | 1 | 36 | | 3,508 | | | 16,000 |
| Total | 67 | 1,526,777 | 4,107 | 4,544,924 | 7,927,700 | 118,830,300 | 86,208,400 |
| Other "lode" material: | | | | | | | |
| Dry gold: | | | | | | | |
| Mill cleanings | 1 | | 4 | 1 | | | |
| Old tailings | 2 | 525 | 44 | 106 | 9,700 | 300 | |
| Copper: Old tailings | 1 | 3,126 | 257 | 1,104 | 290,300 | | |
| Lead-zinc: | | | | | | | |
| Mill cleanings | 5 | 336 | 5 | 2,556 | 600 | 87,400 | 96,300 |
| Old tailings | 3 | 114,840 | 1 | 62,796 | 1,100 | 1,950,200 | 870,000 |
| Old slag | 1 | 175 | | 96 | | 16,400 | 21,600 |
| Zinc: | | | | | | | |
| Old slag fumed | 1 | 1,199 | | 119 | | 44,600 | 265,600 |
| Old slag smelted | 1 | 71,774 | | 31,906 | | 2,854,700 | 11,328,500 |
| Total | 15 | 191,975 | 311 | 98,684 | 301,700 | 4,953,600 | 12,582,000 |
| Total "lode" material | 104 | 2,071,451 | 7,507 | 13,471,364 | 13,312,000 | 128,642,000 | 99,122,000 |
| Gravel (placer operations) | 21 | (4) | 2,522 | 552 | | | |
| Total | 125 | | 10,029 | 13,471,916 | 13,312,000 | 128,642,000 | 99,122,000 |

[1] Detail will not necessarily add to total, because some mines produce more than 1 class of material.
[2] Includes production from tungsten ore yielding copper-lead concentrates.
[3] Tungsten ore tonnage, 71,742, not included in total.
[4] 351,978 cubic yards.

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by types of material processed and methods of recovery, in terms of recoverable metals**

| Method of recovery and type of material processed | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Amalgamation | 954 | 566 | | | |
| Concentration, and smelting of concentrates: | | | | | |
| Ore [1] | 5,965 | 13,317,438 | 12,713,000 | 123,237,100 | 86,505,000 |
| Old tailings | 1 | 62,796 | 1,100 | 1,950,200 | 870,000 |
| Total | 5,966 | 13,380,234 | 12,714,100 | 125,187,300 | 87,375,000 |
| Direct smelting: | | | | | |
| Ore | 283 | 54,681 | 207,300 | 451,300 | 35,000 |
| Old tailings | 295 | 1,205 | 300,000 | 300 | |
| Old slag | | 32,121 | | 2,915,700 | 11,615,700 |
| Mill cleanings | 9 | 2,557 | 600 | 87,400 | 96,300 |
| Total | 587 | 90,564 | 597,900 | 3,454,700 | 11,747,000 |
| Placer | 2,522 | 552 | | | |
| Grand total | 10,029 | 13,471,916 | 13,312,000 | 128,642,000 | 99,122,000 |

[1] Includes production from tungsten ore yielding copper-lead concentrates.

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals**

| County and district | Mines producing | | Material sold or treated (short tons) | Gold, lode and placer (fine ounces) [1] | Silver, lode and placer (fine ounces) [2] | Copper (pounds) | Lead (pounds) | Zinc (pounds) | Total value |
|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | | | | | | | |
| Blaine County: | | | | | | | | | |
| Little Wood River and Warm Springs [3] | 3 | ------- | 56,833 | 180 | 345,233 | ------- | 3,608,300 | 2,775,300 | $1,265,472 |
| Mineral Hill and Camas | 7 | ------- | 2,476 | 3 | 38,499 | ------- | 709,700 | 330,700 | 191,678 |
| Bonner County: | | | | | | | | | |
| Clark Fork | 2 | ------- | 128 | 4 | 7,464 | 400 | 85,900 | 1,000 | 20,688 |
| Lakeview and Pend Oreille | 4 | ------- | 6,991 | 176 | 58,053 | 3,600 | 62,100 | 17,000 | 72,310 |
| Custer County: | | | | | | | | | |
| Alder Creek and Alta [3] | 5 | ------- | 1,435 | 31 | 1,692 | 30,000 | 70,700 | ------- | 26,466 |
| Bayhorse | 3 | ------- | 40,612 | 72 | 187,142 | 34,000 | 3,214,300 | 2,406,000 | 1,020,610 |
| Yankee Fork | 3 | 1 | 35 | 81 | 1,411 | ------- | 7,000 | ------- | 5,211 |
| Elmore County: | | | | | | | | | |
| Black Warrior, Dixie, and Yuba [3] | 2 | 1 | 17 | 48 | 42 | ------- | ------- | ------- | 1,718 |
| Middle Boise | 3 | ------- | 3,907 | 1,344 | 8,740 | ------- | ------- | ------- | 54,949 |
| Gem County: West View | 1 | ------- | 21 | 13 | 143 | ------- | ------- | ------- | 584 |
| Idaho County: | | | | | | | | | |
| Camp Howard (Salmon River) and Warren [3] | 2 | [4] 2 | 78 | 64 | 20 | ------- | ------- | ------- | 2,258 |
| Elk City | 1 | [4] 4 | 15 | 2,370 | 487 | ------- | ------- | ------- | 83,391 |
| Ten Mile | ------- | 1 | ------- | 6 | ------- | ------- | ------- | ------- | 210 |
| Latah County: Hoodoo | ------- | 1 | ------- | 4 | ------- | ------- | ------- | ------- | 140 |
| Lemhi County: | | | | | | | | | |
| Birch Creek, McDevitt, and Yellow Jacket | 3 | 1 | 601 | 3 | 197 | 20,000 | 5,700 | 200 | 9,704 |
| Blackbird | 1 | ------- | 273,704 | 2,412 | 6,066 | 6,656,400 | ------- | ------- | 2,918,880 |
| Blue Wing | 1 | ------- | [3] | 24 | 133,326 | 197,800 | 289,400 | ------- | 251,008 |
| Eureka | 3 | ------- | 5,158 | 313 | 1,855 | 515,200 | 300 | ------- | 231,641 |
| Eldorado | 1 | ------- | 9 | 4 | 67 | 2,200 | ------- | ------- | 1,136 |
| Junction and Nicholia [3] | 3 | ------- | 260 | 1 | 212 | ------- | 21,200 | 22,100 | 6,584 |
| Texas | 3 | ------- | 84 | 10 | 880 | 400 | 25,400 | 9,700 | 6,633 |
| Shoshone County: | | | | | | | | | |
| Beaver | 5 | ------- | 21,521 | ------- | 33,118 | 39,400 | 1,516,800 | 2,126,300 | 576,159 |
| Eagle | ------- | 1 | ------- | 5 | 1 | ------- | ------- | ------- | 176 |
| Evolution | 3 | ------- | 252,834 | 1,096 | 6,160,630 | 2,340,400 | 4,752,200 | 323,900 | 7,399,180 |
| Hunter | 5 | ------- | 282,390 | 539 | 1,100,245 | 299,200 | 25,189,000 | 28,881,900 | 9,053,295 |
| Lelande | 5 | ------- | 67,572 | 43 | 125,640 | 9,000 | 4,895,300 | 5,953,800 | 1,703,274 |
| Placer Center | 4 | ------- | 163,729 | 375 | 2,796,277 | 2,702,000 | 5,554,400 | 2,248,300 | 4,872,305 |
| Union | ------- | 1 | ------- | 1 | ------- | ------- | ------- | ------- | 35 |
| Yreka | 14 | ------- | 886,735 | 723 | 2,447,303 | 388,000 | 78,534,300 | 53,941,800 | 22,125,050 |
| Undistributed [5] | 17 | 8 | 4,306 | 84 | 17,173 | 74,000 | 100,000 | 84,000 | 77,142 |
| Total Idaho | 104 | 21 | 2,071,451 | 10,029 | 13,471,916 | 13,312,000 | 128,642,000 | 99,122,000 | 51,977,887 |

[1] Source of gold: 7,507 ounces from lode mines; 2,522 ounces from placers.
[2] Source of silver: 13,471,364 ounces from lode mines; 552 ounces from placers.
[3] Combined to avoid disclosing individual company confidential data.
[4] Includes production from property not classified as a mine.
[5] Tungsten ore yielding copper-lead concentrates.
[6] Includes values and quantities that cannot be shown separately for Boise district, Ada County; Seven Devils district, Adams County; Fort Hall district, Bannock County; Boise Basin, South Fork Payette River and West View districts, Boise County; Port Hill district, Boundary County; Dome district, Butte County; Little Smoky and Carrietown district, Camas County; Black Pine district, Cassia County; Birch Creek district, Clark County; Burnt Creek and Ruby Creek districts, Clearwater County; Snake River district, Jerome County; Wolf Lodge district, Kootenai, County; Carson or French and South Mountain districts, Owyhee County; and Thunder Mountain district, Valley County.

465877—58——24

Digitized by Google

The Bunker Hill Co. announced that development had been initiated on four silver-copper ore shoots along the Alhambra fault vein in its Crescent mine on Big Creek. The discovery was made during the course of a $1.1 million DMEA project at the property while the Crescent shaft was being deepened. At its lead smelter the company began initial operation of a furnace for treatment of copper matte to produce 97- to 98-percent blister copper.

**Gold.**—Gold production in the State was the lowest since the earliest mining activities in the middle of the 19th century. A total of 10,029 ounces was recovered in 1956—the sixth consecutive year of declining output. The Calera Mining Co. Blackbird mine (copper-cobalt ore) replaced Clearwater Dredging Co. as Idaho's major producer. Operations at the Boise-Rochester group, Elmore County, by five former employees of Talache Mines, Inc., added to the State total. Most of the remainder of the gold produced in Idaho in 1956 came from placers and as byproduct of ores produced at lead-zinc mines.

At the request of wildlife organizations, which were successful in promoting passage of regulatory dredge legislation, the State checked dredge operations closely. The State Land Board canceled the Clearwater Dredging Co. permit in August because of the operator's failure to maintain reasonable stream clarity. The company, which had operated since 1952 on the Crooked River in Idaho County, announced that the action would be contested. The company planned to challenge the constitutionality of the law on the grounds that it did not establish standards for stream turbidity and was discriminatory by pertaining only to dredges having a daily capacity greater than 500 cubic yards. The Idaho State Land Board granted Idaho Warren Co., Inc., a permit for dredging to recover gold in the Warren area of southern Idaho County; a dragline and washing plant were to be utilized.

**Iron Ore.**—Production and shipment of a quantity of iron ore by the Inoco Ore Corp. from a deposit near Weiser, Washington County, during the course of development were reported.

**Lead.**—Lead production was down from its 1950 high of 100,025 tons to 64,321 tons in 1956. Output during the year was about the same level as in 1955. Less metal was recovered from lead-zinc ore extracted from the Bunker Hill and Star mines (The Bunker Hill Co.) in 1956 than in the preceding year. According to The Bunker Hill Co. annual report, the rate of extraction of ore at the Bunker Hill mine again set a new record for tons mined, despite a strike in May that caused a material loss in tonnage for that month. The decrease in metal recovered was due to the mining of lower grade ores. Breakdowns at the Star mine caused the loss of about 1 month of production, with the grade of ore remaining about the same as in 1955. The Bunker Hill and Star mines continued to be the principal sources of lead in Idaho; the Bunker Hill output alone approached half of the State total.

A 5-month strike that paralyzed all mining activity at properties of the "Sixteen Operators" bargaining group ended February 1, 1956, with the majority of workers promptly returning to their former jobs. It was begun August 23, 1955, by members of the International Union of Mine, Mill & Smelter Workers, affected about 850 men, and

Digitized by Google

was the longest and costliest strike in the history of the district. Most properties resumed limited production quickly. Of the strike-bound mines, the Page recorded a substantial increase and the Frisco decreased somewhat in 1956 (American Smelting & Refining Co. operations). Increases were reported by Day Mines, Inc. (Dayrock, Tamarack, and Hercules mines), and Sidney Mining Co. (Sidney mine). Ore reserves of the Lucky Friday silver-lead mine continued to improve with depth, thus assuring its place as the newest major producer in the Coeur d'Alene district. The operation reported a substantial gain in output above the 1955 level. With continued development, new reserves were anticipated. Lucky Friday ore was custom-milled at the Golconda Lead Mines 200-ton concentrator.

In 1956 Idaho's most prominent lead and zinc producer effected major organizational revisions to facilitate anticipated expansion. The firm's 69-year-old name of Bunker Hill & Sullivan Mining & Concentrating Co. was shortened to The Bunker Hill Co. and company headquarters were transferred to San Francisco. The company acquired full ownership of Northwest Lead Co. of Seattle, having held a controlling interest since 1931. Northwest Lead, producer of sheet lead, lead pipe, alloys, and solder under the Bunker Hill trade name, became the sales and fabrication division of Bunker Hill.

**Mercury.**—Quicksilver output of 3,394 flasks was more than triple the 1955 total and the highest since 1943, when Bonanza Mines, Inc., produced 4,261 flasks from the Hermes mine in Valley County. Value of production (calculated at an average price for the year at New York of $259.92 per flask) was $882,168. The Hermes mine, renamed the Cinnabar mine and operated by Holly Minerals Corp. after its purchase from United Mercury Mines Corp. in August 1955, was one of the two contributors to the Idaho 1956 total. Operations at the mine were halted on August 19 by a fire, which destroyed ore bins, ore crusher, and the mill building.

By far the greater part of the 1956 total was derived from operations of the Rare Metals Corporation of America at the Idaho-Almaden mine in Washington County. A total of 62,783 tons of ore containing 0.1 percent mercury was taken from 4 shallow open pits and 59,909 tons was fed to the 175-ton-per-day plant. A 5½- by 90-foot Gould rotary furnace was used. The Idaho-Almaden property, active previously in 1939–42 with an output of several thousand flasks, was reopened by the Rare Metals company in September 1955. The deposit was reported to contain approximately 525,000 tons of ore averaging 3.6 pounds of mercury per ton.[5] Four ore bodies were being developed.

**Nickel.**—Nickel was contained in cobalt concentrate produced at the Calera Mining Co. Blackbird mine, Lemhi County. Output in 1956 was 98,495 pounds of contained nickel—a substantial increase over the 65,782 pounds produced in 1955.

**Rare-Earth Metals.**—The Porter Bros. Corp. dredging operation in Bear Valley, Valley County, was the only source of columbium (niobium)-tantalum minerals in the State in 1956, as well as the only large producer in the Nation. The company began full-scale operations with 2 dredges early in the year under a contract that provided

[5] Reynolds, John R., Idaho-Almaden Mercury Mine—Mining and Geology: Min. Eng., vol. 8, No. 11, November 1956, pp. 1096-1099.

Digitized by Google

for purchase by the Government of 1,050,000 pounds of columbium-tantalum pentoxides of 90-percent pentoxide content. The contract was signed in December 1954. Dredge concentrate was trucked to the company plant at Lowman, Boise County, for separation of the various heavy-sand components, and the resulting columbium-tantalum concentrate was shipped to the Mallinckrodt Chemical Co. for processing under terms of the Government contract.

The Baumhoff-Marshall, Inc., and Idaho-Canadian Dredging Co. dredges near Cascade, Valley County, which produced monazite concentrate from 1951 until forced to suspend operations in mid-1955 owing to lack of a market, remained idle throughout the year. The Baumhoff-Marshall separation plant at Boise re-treated the accumulated stockpile of ilmenite concentrate and recovered a quantity of monazite, which was stored pending location of a suitable market. (See Titanium.)

A report was published on the history, location, and uses and outlook for metals from placer concentrations of heavy or "black" sands found in the Northwest, primarily in Idaho.[6]

**Silver.**—Silver production declined to its lowest level since 1949; output was 3 percent less than in 1955. As in previous years, the bulk of the metal was derived from the Shoshone County operations of the Sunshine Mining Co. (Sunshine mine and adjoining properties), American Smelting & Refining Co. (Galena mine), The Bunker Hill Co. (Bunker Hill mine), and Polaris Mining Co. (Silver Summit mine). The Sunshine operations alone supplied more than a third of the State total.

Of the State's principal silver producers, decreases in output were reported by the Sunshine (silver ore), Bunker Hill (lead-zinc ore), and Silver Summit (silver ore) mines, while the Galena (silver ore) and Lucky Friday (lead-zinc ore) mines showed an increased yield. Shoshone County mines produced 94 percent of the State total. Outside Shoshone County the Triumph lead-zinc mine of Triumph Mining Co. in Blaine County was an important source of silver.

**Titanium.**—Baumhoff-Marshall, Inc., treated a large portion of its stockpiled ilmenite concentrate at the Boise separation plant. The bulk of the upgraded concentrate was shipped to the National Lead Co., St. Louis, Mo. The ilmenite stockpile, comprising the ilmenite and titaniferous magnetite fraction of dredge concentrate treated by electromagnetic and electrostatic methods to recover monazite, was accumulated during 1951–55 as a result of dredging alluvial heavy-sand deposits in Valley County just south of Cascade. (See Rare-Earth Metals.)

**Tungsten.**—Output of tungsten ore and concentrate declined 9 percent in quantity and 13 percent in value owing to cessation of purchases for the Government stockpile during a part of the year and to purchases by the Government at reduced prices during the remainder of the year. The Bradley Mining Co. Ima mine, Lemhi County, continued to supply a large part of the State total. The company produced 71,742 tons of crude ore from which were extracted a high-grade huebnerite (manganese tungstate) concentrate, scheelite (calcium tungstate) concentrate, and sulfide concentrate containing

[6] Kaufman, A. J., Jr., and Baber, K. D., Potential of Heavy-Mineral-Bearing Alluvial Deposits in the Pacific Northwest: Bureau of Mines Inf. Circ. 7767, 1956, 36 pp.

Digitized by Google

gold, silver, copper, and lead. The Cordero Mining Co. Wild Horse mine in Custer County was operated during the year; the mine was opened in 1954, and initial shipments were made in 1955. Other producers during the year were Hells Canyon Tungsten Mines, Inc. (Alaska mine, Adams County), and McRae Tungsten Corp. (Snowbird mine, Valley County). In Custer County activity was evident at the Salmon River Scheelite Corp. Tungsten Jim property. Exploration with DMEA participation was conducted and milling equipment was installed. Production was first reported for the property in 1954. A report on tungsten deposits was published during the year.[7]

**Uranium.**—Although uranium activities were considerably more limited in Idaho in 1956 than in its sister State, Washington, there still was evidence that the "fever" existed. Prospecting and limited development were reported in Blaine, Boundary, Custer, Idaho, and Lemhi Counties.

**Zinc.**—Output of zinc was 7 percent (3,753 tons) less than in 1955 and was the lowest since 1939. The Star mine continued to be the largest producer in the State, despite a sizable drop in output from 1955. The Bunker Hill mine ranked second in quantity of zinc produced, displacing old-slag-fuming operations at the Bunker Hill smelter that yielded substantially less zinc, owing in part to a 6-week shutdown to effect extensive renovations. Output from the Page mine increased considerably. Other important contributors were, in order of output, the Sidney, Frisco, Triumph, Clayton, and Morning mines. Among these, the Sidney, Clayton, and Morning operations reported increased output for 1956. Of the principal producers mentioned, all except the Triumph (Blaine County) and Clayton (Custer County) were in Shoshone County.

According to The Bunker Hill Co. annual report, production from the company electrolytic zinc plant at Kellogg again exceeded all previous records. Interruptions due to labor disputes were avoided, and there was no lack of zinc concentrate to process. Maximum production was maintained throughout the year by all four electrolytic-cell units simultaneously, with construction work on the new fifth and sixth units, addition of which was estimated to cost more than $7 million.

## NONMETALS

**Barite.**—The J. R. Simplot Co. continued active during the year at the open-pit Sun Valley barite mine near Hailey, Blaine County. Crude barite was shipped to the company plant at Pocatello for processing and grinding before marketing for use in rotary-drilling fluids. Production of crude and ground barite increased substantially, compared with 1955.

**Cement.**—Idaho Portland Cement Co. continued to operate its cement plant at Inkom, Bannock County. Production and shipments decreased 7 and 8 percent, respectively, in 1956, compared with the preceding year. The Inkom plant continued to be the only cement-producing plant in the State during 1956. Limestone, the principal raw material, was obtained from the company-operated Inkom quarry.

---

[7] Cook, E. F., Tungsten Deposits of South-Central Idaho: Idaho Bureau of Mines and Geology Pamph. 108, June 1956, 40 pp.

Digitized by Google

**Clays.**—Output of clays in Idaho decreased sharply compared with 1955. Fire-clay production was recorded from one operation in Latah County, and miscellaneous clay was mined in Ada, Bonneville, and Cassia Counties. E. N. Bennett of Payette reported production of a small quantity of bentonite from the Ben-Jel mine near Oreana, Owyhee County. The material was marketed chiefly for use in sealing potato cellars; a smaller quantity was used in rotary-drilling muds. The operation was active part of the year.

The A. P. Green Co. of Mexico, Mo., during the year purchased the properties of the Troy Firebrick Co. at Troy, Latah County. Reserves of fire clay were developed by the company, and production of firebrick and refractories was to be continued at this plant. The Jensen Brick Co. of Payette, Payette County, reported its pit and plant inactive during 1956.

Construction of a plant in the Moscow area, Latah County, to produce alumina (aluminum oxide) from extensive local clay deposits was in prospect at the close of 1956. The Anaconda Co. announced that small-scale production of alumina—the primary raw material used by aluminum-reduction plants—had been achieved at its test plant at Anaconda, Mont. A pilot plant having a capacity of 50 tons of clay per day to confirm test-plant results was scheduled for construction at Anaconda at a cost of about $1 million. Clay reserves in the vicinity of Moscow were taken under option by the company, a subsidiary of which (Anaconda Aluminum Co.) was operating a new aluminum-reduction plant at Columbia Falls, Mont., using alumina derived from bauxite from southern States and foreign sources.

The J. R. Simplot Co. investigated clay deposits in the Bovill area, Latah County. Test drilling and sampling were conducted to study the quality of these clay deposits as possible sources of raw material for ceramic purposes and as a filler material for use in manufacturing paper.

Clay was the subject of two publications released during the year.[8]

**Garnet.**—Idaho Garnet Abrasive Co. continued operating its Emerald Creek deposit near Fernwood, Benewah County. Lessened demand for abrasive garnet resulted in a 17-percent production decrease compared with 1955. Output was the lowest since 1950.

**Gem Stones.**—Gem-material collection was largely the product of numerous hobbyists, vacationers, and individual collectors from out-of-State; such material included stones of the semiprecious variety, suitable for cutting and polishing. Polished and cut stones were used in making costume jewelry and for decorative purposes, such as bookends, carvings, and a wide variety of miscellaneous ornamental purposes. Gem-quality sillimanite having such chatoyancy that it was a very attractive gem material was reported recovered in Nez Perce County. Sillimanite of this quality was in demand because of its relative scarcity.

**Gypsum.**—The Rock Creek gypsum mine, 20 miles northwest of Weiser, Washington County, was reported inactive during 1956 by

[8] Kelly, H. J., Strandberg, K. G., and Mueller, J. I., Ceramic Industry Development and Raw-Material Resources of Oregon, Washington, Idaho, and Montana: Bureau of Mines Inf. Circ. 7757, 1956, 77 pp.
Hubbard, C. R., Clay Deposits of North Idaho: Idaho Bureau of Mines and Geology, Pamph. 109, July 1956, 36 pp.

Digitized by Google

Kenneth Steck, owner. Gypsum from the deposit has been used as a fertilizer and soil conditioner.

**Mica.**—No mica production was reported in Idaho during 1956. The last commercial operation in the State—the Muscovite mine of the Idaho Beryllium & Mica Corp.—was closed in mid-1955 and final shipment was made at that time. Production in recent years was marketed to the Government for stockpiling purposes.

**Phosphate Rock.**—Output of marketable phosphate rock in Idaho advanced to 1.4 million long tons in 1956—an 8-percent rise over that in 1955. This was the fourth consecutive year in which production of this commodity in the State increased. Larger output reported by the Monsanto Chemical Co. from the Ballard surface mine in Caribou County and initial production from the J. R. Simplot Co. Centennial mine on the Idaho-Montana border (Clark County) were the principal reasons for the advance in production. Phosphate rock sold or used during 1956 totaled 1.2 million long tons. This was an 8-percent increase over the 1.1 million long tons reported sold or used in 1955. The largest single use for phosphate rock mined in the State was for manufacturing elemental phosphorus; smaller quantities were used in making phosphoric acid and triple superphosphate and superphosphate fertilizers.

The Anaconda Co. mined phosphate rock from the Conda mine at Conda, Caribou County. Rock was crushed and beneficiated before shipment to the company fertilizer plant at Anaconda, Mont. During the year the underground No. 3 mine was closed owing to high operating costs. The company also reported temporary shutdown of its strip mine during the second half of 1956. Increased demand for ammonium-type fertilizers in preference to the straight phosphate fertilizers resulted in The Anaconda Co. starting to construct an ammonium phosphate fertilizer plant at Anaconda. This facility was scheduled for completion in 1957. The Conda operations produced at a decreased rate compared with 1955.

The J. R. Simplot Co. operated the Gay mine (an open pit) east of Fort Hall, Bingham County. Production of phosphate rock was used at the company fertilizer plant at Pocatello for manufacturing wet-process phosphoric acid and triple superphosphate and superphosphate fertilizers. Phosphatic shale also produced at this mine was marketed to the Westvaco Mineral Products Division, Food Machinery & Chemical Corp. for processing to elemental phosphorus. Output of phosphate rock and phosphatic shale from the Gay mine remained at substantially the 1955 level. In August, the initial shipment of phosphate rock was made from the J. R. Simplot Co. Centennial Mountain mine. The rock was trucked to a rail siding at Monida, Mont., and shipped to Canadian fertilizer plants.

Monsanto Chemical Co. mined phosphate rock from the Ballard surface mine north of Soda Springs, Caribou County, at a sharply increased rate compared with 1955. Production was used at the company elemental-phosphorus plant at Soda Springs.

Westvaco Mineral Products Division, Food Machinery & Chemical Corp., operated the Fort Hall phosphate mine in Bingham County and the electric-furnace elemental-phosphorus plant at Pocatello. Phosphatic shale mined at the Gay mine (J. R. Simplot Co.) and rock

Digitized by Google

from the company-operated Fort Hall mine were reduced to elemental phosphorus at the Pocatello plant.

San Francisco Chemical Co. obtained phosphate rock from the Waterloo surface mine east of Montpelier, Bear Lake County. Output, which was sold for use at phosphate fertilizer plants, was at a reduced rate compared with the previous year. J. A. Terteling & Sons mined phosphate rock from a surface mine in Caribou County. Bingham County continued to be the principal producing county due to the large tonnage of phosphatic shale mined at the J. R. Simplot Co. Gay mine. Caribou, Bear Lake, and Clark Counties also reported active operations with an output of marketable phosphate rock.

Potash Company of America carried out experimental and development work at the McIlwee phosphate property near Paris, Bear Lake County. The company reported this as a prospect only; it was closed indefinitely at the year end.

During the year Stauffer Chemical Co. investigated phosphate claims in Bear Lake County. San Francisco Chemical Co. was developing these deposits in cooperation with Stauffer geologists. Estimates of reserves of phosphate rock at the property exceeded 5 million tons. The company operated fertilizer plants at Tacoma, Wash., and Richmond and Vernon, Calif. Central Farmers Fertilizer Co. continued to develop the Georgetown Canyon phosphate property in Bear Lake County. The company announced plans for constructing a $7.5 million phosphate-fertilizer processing plant at Georgetown.

A Bureau of Mines report of investigations published during the year detailed progress in research toward adaptation of a planing machine, such as had been developed for coal mining, to the mining of underground seams of phosphate rock.[9]

**Pumice.**—Production of 102,000 tons of crude and prepared pumice from 3 operations in Bonneville County was reported for 1956. Pumice, Inc., operated the Katie Lee pit and preparation plant near Ammon; Gemstone Insulation Products Co. mined and prepared pumice from the Albino pit, 8 miles east of Idaho Falls; and Idaho Falls Pumice Co. mined pumice from the Indian Siding pit at Idaho Falls. Production was used chiefly as concrete-aggregate material. The pumice operations of the Idaho Falls Brick & Tile Co., Bonneville County, and Sun-ite Corp., Blaine County, were reported idle during 1956. Development work consisting of stripping the overburden from the Rock Top pumice pit was reported by the Idaho Falls Brick & Tile Co.

Producers reported a good demand for the pumice product during 1956 but also reported that competition from expanded-shale lightweight-aggregate material was increasing.

**Sand and Gravel.**—A gross output of 7.9 million tons of sand and gravel valued at $5.7 million was reported for 1956; this was a 9-percent decrease in tonnage and a 44-percent increase in total value of sand and gravel produced. In 1956 commercial producers supplied 2.5 million tons valued at $2.4 million, and Government-and-contractor production was 5.4 million tons valued at $3.3 million. In 1955 the yield from commercial operations totaled 1.7 million tons

[9] Howard, T. E., Design and Development of a Pneumatic Vibrating-Blade Planer for Mining Phosphate Rock: Bureau of Mines Rept. of Investigations 5219, 1956, 30 pp.

Digitized by Google

valued at $1.5 million, and Government-and-contractor production was 6.9 million tons valued at $2.4 million.

**TABLE 11.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | | Percent of change in— | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Average | Short tons | Value | Average | Tonnage | Average value |
| COMMERCIAL OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 759,977 | $905,408 | $1.19 | 640,720 | $765,501 | $1.19 | −16 | |
| Road material | 744,018 | 547,132 | .74 | 1,460,298 | 1,307,541 | .90 | +96 | +22 |
| Railroad ballast | (1) | (1) | | (1) | (1) | | | |
| Other [2] | 244,900 | 53,787 | .22 | 423,969 | 322,925 | .76 | +73 | +500 |
| Total | 1,748,895 | 1,506,327 | .86 | 2,524,987 | 2,395,967 | .95 | +44 | +10 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 3,015,026 | 962,121 | .32 | 1,750,381 | 164,158 | .09 | −42 | −72 |
| Road Material | 3,888,217 | 1,465,428 | .38 | 3,599,092 | 3,101,292 | .86 | −7 | +126 |
| Total | 6,903,243 | 2,427,549 | .35 | 5,349,473 | 3,265,450 | .61 | −23 | +74 |
| ALL OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 3,775,003 | 1,867,529 | .49 | 2,391,101 | 929,659 | .39 | −37 | −20 |
| Road material | 4,632,235 | 2,012,560 | .43 | 5,059,390 | 4,408,833 | .87 | +9 | +102 |
| Railroad ballast | (1) | (1) | | (1) | (1) | | | |
| Other [2] | 244,900 | 53,787 | .22 | 423,969 | 322,925 | .76 | +73 | +500 |
| Grand total | 8,652,138 | 3,933,876 | .45 | 7,874,460 | 5,661,417 | .72 | −9 | +60 |

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Includes blast, filter, and ballast sands and sand and gravel used for miscellaneous unspecified purposes.

The 1.6 million-ton drop in the Government-and-contractor production category was due primarily to the decreased use of sand and gravel by the Bureau of Reclamation at the Palisades project, Bonneville County, and by the Idaho Department of Highways. The rise in overall value during 1956, despite a decrease in tonnage produced, was caused by the quality of material contracted for by the Idaho State Department of Highways. There was a large increase in the quantity of prepared sand and gravel and a decrease in the quantity of lower value pit-run material used by this agency.

Sixty-four percent of the 7.9 million tons of sand and gravel produced in 1956 was used for road-building and maintenance purposes, 30 percent for building and construction projects, and the remaining 6 percent for other miscellaneous uses, including railroad ballast and special railroad and construction sands. Production was reported from operations in 36 of the State's 44 counties. Output in Bonneville County ranked the county first in tonnage of sand and gravel produced, with Twin Falls and Bannock Counties in second and third positions.

Digitized by Google

Del Monte Properties, Inc., acquired the silica deposit and plant of the Gem Silica Co., Emmett, Gem County. Production of special building sand was continued at this facility, but at a reduced level compared with 1955.

**Stone.**—Output of 1.8 million tons of stone valued at $2.7 million was reported for 1956; this represented increases of 17 percent in tonnage and 47 percent in value compared with the preceding year. A rise in the quantity of crushed stone used for road building and maintenance by the Idaho Department of Highways was the principal reason for the increase.

The output of crushed limestone remained substantially the same as in 1955. Production was recorded from operations of the Idaho Portland Cement Co., Bannock County, and Lewiston Lime Co., Lewis County. Output was used principally in manufacturing cement and at metallurgical works, paper mills, and sugar refineries. A small quantity of crushed limestone was used for agricultural purposes. Quartzite for electric-furnace flux at phosphate-processing plants was produced by Wells Cargo, Inc., Bannock County, and by the Monsanto Chemical Co., Caribou County. Morrison-Knudsen Co., Inc., crushed quartzite for railroad ballast from a quarry near Inkom, Bannock County.

Fifty-nine percent of the 1.8 million tons of stone produced in 1956 was used for road-building and maintenance purposes compared with 51 percent for 1955. Production of stone was reported from 16 of the State's 44 counties.

**Sulfuric Acid.**—Production of byproduct sulfuric acid was continued during the year by The Bunker Hill Co. at Kellogg. In its 1956 annual report to shareholders, the company reported production of 45,860 tons of salable acid. The acid plant, adjacent to the company electrolytic zinc plant at Kellogg, utilized waste stack gases ($SO_2$) to make sulfuric acid.

## REVIEW BY COUNTIES AND DISTRICTS

**Ada.**—The sand-separation plant of Baumhoff-Marshall, Inc., at Boise was reactivated during the year to reprocess ilmenite (titanium-iron oxides) concentrate stockpiled at the plant from 1951–55 as a byproduct of monazite (a rare-earth phosphate mineral) production. The plant—which treated concentrate from dredges operating in Valley County—had been closed in mid-1955 owing to loss of the company market for monazite. The upgraded ilmenite concentrate produced in 1956 was shipped to the National Lead Co. in St. Louis, Mo., for use in making titanium products. Monazite recovered during the reprocessing was stockpiled.

Sand and gravel for building and road use was produced by Quinn-Robbins Co., Inc., and Chaussee Swan Gravel Co., both of Boise, and prepared road gravel was processed by Virgil Thompson of Gooding. County crews and one contractor supplied the gravel requirements of the county road department. Clay for use in making building brick and tile was mined by the Pullman Brick Co., Inc., at Boise. Production was above the 1955 level.

Digitized by Google

**Boise District.**—Ore containing recoverable gold and silver was shipped to the Midvale, Utah, smelter by R. W. Cox and A. Elmestrom. Joseph F. Kallas, Sr., recovered gold and silver from old tailing.

**TABLE 12—Value of mineral production in Idaho, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Ada | $321,049 | $333,600 | Sand and gravel, clays, gold, silver. |
| Adams | (1) | 70,605 | Stone, tungsten, copper, silver, gold. |
| Bannock | (1) | (1) | Cement, stone, sand and gravel, copper, lead, silver, gold. |
| Bear Lake | (1) | (1) | Phosphate rock, sand and gravel. |
| Benewah | (1) | (1) | Garnet, stone. |
| Bingham | (1) | (1) | Phosphate rock, sand and gravel. |
| Blaine | (1) | 1,823,676 | Lead, zinc, silver, sand and gravel, barite, gold. |
| Boise | 6,364 | 530 | Gold, silver. |
| Bonner | 938,779 | 286,414 | Sand and gravel, stone, silver, lead, gold, zinc, copper. |
| Bonneville | 673,178 | 738,088 | Sand and gravel, pumice, stone, clays. |
| Boundary | 73,064 | 29,416 | Sand and gravel, lead, stone, silver, zinc. |
| Butte | 13,689 | 69,183 | Sand and gravel, lead, silver. |
| Camas | 58,348 | 39,172 | Sand and gravel, gold, silver. |
| Canyon | 202,991 | 254,516 | Sand and gravel, stone. |
| Caribou | (1) | (1) | Phosphate rock, stone, sand and gravel. |
| Cassia | 229,585 | 142,930 | Sand and gravel, clays, silver, zinc. |
| Clark | (1) | (1) | Phosphate rock, sand and gravel, copper, silver. |
| Clearwater | (1) | 227,760 | Stone, sand and gravel, silver, gold. |
| Custer | (1) | 1,348,314 | Lead, zinc, silver, sand and gravel, tungsten, copper, gold. |
| Elmore | 213,280 | 152,111 | Sand and gravel, gold, silver. |
| Franklin | 34,940 | 51,619 | Sand and gravel. |
| Fremont | 47,190 | 274,892 | Do. |
| Gem | 73,374 | 80,427 | Sand and gravel, stone, gold, silver. |
| Gooding | 78,803 | 230,900 | Sand and gravel. |
| Idaho | 337,439 | 970,073 | Sand and gravel, stone, gold, silver. |
| Jefferson | 73,773 | (1) | Sand and gravel. |
| Jerome | 75,235 | 75,620 | Sand and gravel, gold, silver. |
| Kootenai | 104,037 | 149,920 | Sand and gravel, stone, silver. |
| Latah | 218,389 | 741,598 | Stone, clays, gold. |
| Lemhi | 6,343,967 | 7,874,962 | Cobalt, copper, silver, sand and gravel, gold, nickel, lead, zinc. |
| Lewis | (1) | (1) | Stone, sand and gravel. |
| Lincoln | (1) | (1) | Sand and gravel. |
| Madison | 72,000 | 41,549 | Sand and gravel, stone. |
| Minidoka | 34,610 | 3,332 | Do. |
| Nez Perce | (1) | 232,712 | Sand and gravel. |
| Oneida | 85,778 | | Do. |
| Owyhee | 104,118 | 72,062 | Copper, silver, zinc, lead, gold, clays. |
| Payette | (1) | 9,000 | Sand and gravel. |
| Power | 26,448 | 41,117 | Do. |
| Shoshone | 44,319,737 | 45,894,066 | Lead, zinc, silver, copper, antimony, gold. |
| Teton | | 113,106 | Sand and gravel. |
| Twin Falls | 249,973 | 581,277 | Do. |
| Valley | 711,288 | 560,551 | Titanium, mercury, columbium, tantalum, gold, silver. |
| Washington | 145,769 | 714,742 | Mercury, iron ore. |
| Undistributed [2] | 12,646,038 | 10,948,542 | Sand and gravel, stone, gem stones. |
| Total | 68,513,000 | 75,178,000 | |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[2] Includes value of sand and gravel, stone, and gem stones that cannot be assigned to specific counties and value of minerals for counties indicated by footnote 1. (Adjusted to eliminate duplicating the value of stone.)

**Adams.**—Hells Canyon Tungsten Mines, Inc., shipped a substantial quantity of tungsten concentrate from its Alaska property to the Salt Lake Tungsten Co. plant in Salt Lake City, Utah.

Crushed roadstone contracted for by the Idaho Department of Highways was the only nonmetal commodity produced in the county.

**Seven Devils District.**—Otto Russell and Melvin Howell shipped copper ore containing some silver and gold from separate operations.

**Bannock.**—Bannock County ranked second in the State in output value of nonmetal commodities. Cement, stone, and sand and gravel

Digitized by Google

were produced in the county during the year. In addition, phosphate rock, phosphatic shale, and barite obtained from out-of-county sources were processed by firms within the county. Idaho Portland Cement Co. operated the only cement plant in the State at Inkom. The company mined and processed limestone from the Inkom quarry to meet raw-material requirements of the plant. Morrison-Knudsen Co., Inc., prepared railroad ballast from quartzite quarried near Inkom and from gravel. Wells Cargo, Inc., crushed quartzite for use as electric furnace flux in manufacturing elemental phosphorus. A small quantity of stone for road use was produced at county-operated crushers. Patton & Linton, Inc., produced prepared sand and gravel at a fixed plant at Pocatello. Contractors supplied the State highway department with road gravel, and county road crews dug pit-run gravel for road use. J. R. Simplot Co. manufactured phosphate fertilizers at its Pocatello plant. Phosphate rock was obtained from the company-operated Gay mine in Bingham County. Barite shipped from the J. R. Simplot Co. Sun Valley mine at Hailey, Blaine County, was ground and processed at the Pocatello plant. Westvaco Mineral Products Division, Food Machinery & Chemical Corp., continued operating its elemental phosphorus plant, also at Pocatello.

**Fort Hall District.**—A substantial quantity of copper ore containing some lead, gold, and silver was shipped from the Kopper King mine by John E. Smith.

**Bear Lake.**—Phosphate rock continued to be the principal nonmetal commodity produced in the county in 1956. San Francisco Chemical Co. mined phosphate rock from the Waterloo pit east of Montpelier. Production (sold for use in manufacturing phosphate fertilizers) was at a reduced rate compared with 1955. Central Farmers Fertilizer Co. built and operated a phosphate-beneficiation pilot plant at Georgetown and continued to develop the Georgetown Canyon phosphate properties. The company announced plans for constructing a $7.5 million phosphate-rock processing facility and calcium metaphosphate manufacturing plant at Georgetown. Stauffer Chemical Co. was active in developing phosphate properties near Bear Lake. San Francisco Chemical Co. personnel, with the aid of Stauffer geologists, did the testwork. Potash Company of America conducted exploration at the McIlwee phosphate property near Paris. The company reported that work at the project had been terminated at the year end. A quantity of road gravel supplied to the Idaho Department of Highways by W. W. Clyde Construction Co. was the other mineral production in the county.

**Benewah.**—Idaho Garnet Abrasive Co. produced abrasive garnet from its Emerald Creek deposit at Fernwood. This was the only active garnet producer in the State in 1956. The other recorded mineral output in the county was crushed stone, prepared by the Idaho Department of Highways crews for road maintenance and surfacing.

**Bingham.**—Output of phosphate rock and sand and gravel during 1956 ranked the county third in the State in value of nonmetals produced and first in tonnage of marketable phosphate rock prepared. J. R. Simplot Co. continued activities at the Gay mine during the year. Phosphate rock and phosphatic shale were mined to supply the requirements of the company phosphate fertilizer plant and the Westvaco

Digitized by Google

Mineral Products Division, Food Machinery & Chemical Corp., elemental phosphorus plant, respectively. Both plants are at Pocatello, Bannock County. Production from the Gay mine remained at substantially the 1955 level. Westvaco Mineral Products Division mined phosphate rock from the Fort Hall mine for utilization in the manufacture of elemental phosphorus at the company plant. Two contractors supplied road gravel to the Idaho Department of Highways; and the Bureau of Reclamation contracted for production of a small quantity of paving gravel. Contractors furnished the county road department with crushed gravel for road use, and county highway crews dug pit-run road gravel.

**Blaine.**—Two contractors supplied the Idaho Department of Highways with crushed road gravel, and Aslett Construction Co. contracted to supply road-surfacing gravel to the Bureau of Public Roads. J. R. Simplot Co. mined barite from its Sun Valley mine near Hailey. Crude barite was shipped to the company plant at Pocatello for grinding and processing. The pumice pit and plant of the Sun-ite Corp. at Hailey was reported idle during 1956.

*Little Wood River District.*—Eugene Glahn reported shipment of lead ore mined from the Scorpion claim during assessment work.

*Mineral Hill and Camas District.*—Silver Star-Queens Mines, Inc., reported production of 2,348 tons of lead-zinc ore containing 47,529 ounces of silver, 400 tons of lead, and 204 tons of zinc from its property near Bellevue—more than twice the 1955 total. A number of smaller properties also were active in the district. The Anderson Development Corp. shipped silver ore from the Bulldog mine, and lead and zinc ores were shipped by Tom Jackson (Barite Lode mine), George Castle (Edres mine), Charles H. Sheppard (Hillbilly mine), Robert Stefanich (Mogul mine), and Arne Friestad (West Lake group).

*Warm Springs District.*—Output of lead-zinc ore by the Triumph Mining Co. dropped from 77,400 tons in 1955 to 56,555 in 1956. Gross metal content of ore mined was 3,097 ounces of gold, 373,821 ounces of silver, 3,917,922 pounds of lead, and 3,567,721 pounds of zinc. Ore was processed in the company 300-ton flotation mill. A total of 1,406 feet of drifting, 1,144 feet of crosscut tunneling, 756 feet of slusher drifting, and 1,618 feet of raising was reported. A quantity of silver ore was reported shipped by Gutches & Everman from the Hyndman Peak property.

**Boise.**—*Boise Basin District.*—F. J. Clement and E. L. Breen shipped a small quantity of gold ore to the Tacoma, Wash., smelter. Placer output of gold and silver was reported by Don A. Morrison (Comeback), Milton E. Sharp (Red Jack), and John Corder.

*South Fork of Payette River District.*—A few ounces of gold and silver was recovered from a placer by A. W. Josué.

*West View District.*—John W. Davis recovered some gold from the Bender Creek placer.

**Bonner.**—Sand and gravel and stone were produced in the county during the year. Two contractors furnished road-surfacing gravel to the Bureau of Public Roads, and railroad ballast gravel was produced by the Spokane International Railroad Co. at an operation near Clagstone. Crushed stone was supplied by contractors for use by the

Digitized by Google

United States Forest Service. Pacific Northwest Alloys, Inc., reported its quartzite quarry inactive during 1956.

*Clark Fork District.*—Whitedelf Mining & Development Co. reported output of a little more than 100 tons of ore at the Whitedelf mine and completion of 724 feet of drifting. Lead ore from the mine was treated in the company 50-ton flotation mill, and concentrate was shipped to the Bunker Hill smelter at Kellogg. Full-scale production from the mine was resumed late in the year following completion of an exploration program under a DMEA contract. Production in the preceding 3 years was limited to ore recovered during exploration. Don Haefner worked the Lawrence mine from January to April and recovered a quantity of lead ore. A portion of the Lawrence mine, under lease to Anderson & Helms, also yielded lead ore.

*Lakeview District.*—Development was continued by Conjecture Mines, Inc., at the Conjecture lead-zinc mine during the year. Rehabilitation and development of the old property was begun in 1951 by Donald Majer and Lyle Funnell. Conjecture Mines, Inc., was organized in 1955 to continue the work. The company reported addition of a new headframe, new hoist, a dry and compressor building, flotation cells, classifier, crusher, and compressor during the year. Also, the diesel-electric power source employed previously was replaced by tapping power from the Washington Water Power Co. 230,000-volt Cabinet Gorge transmission line. Installation of a special 52-ton transformer in the remote region was required.

A lease and operation agreement between Federal Uranium Corp. and Conjecture Mines, Inc., became effective on November 16. Federal Uranium Corp. reportedly was to spend $200,000 to extend the depth of workings on the Conjecture vein 200 feet and to carry out exploratory drifting on the resulting 700 level. Increasing output to 300 tons per day was planned, and the 1½-compartment shaft was to be enlarged to 2 compartments. A flotation mill also was planned if development proved successful.

At the nearby Weber mine, two companies reported output. Austin-Meyer Corp. conducted an open-pit operation on the upper workings of the Weber mine from June to December, and 5,696 tons of silver ore was recovered. The open-pit operation, which was begun in 1949, was reported by company officials to be approaching an economic limit owing to the difficulty of expanding the pit, which was about 150 feet deep. Ore from the mine was shipped directly to the Tacoma (Wash.) smelter because of its high silica content, which had added value as a flux in smelting. New Rainbow Mining Co. was active at the mine from June through September and a small quantity of ore was produced. The company completed 1,079 feet of drifting, 70 feet of diamond drilling, and 25 feet of raises.

*Pend Oreille District.*—V. Anderson operated the Peak Lode mine for 1 month in the fall and recovered a quantity of silver ore which was treated in a 50-ton mill. Haefner & Schlict produced a small quantity of lead ore from the Little Senator mine.

**Bonneville.**—As a result of the output of relatively large quantities of low-value gravel for use at the Bureau of Reclamation Palisades project, Bonneville County ranked first in the State in tonnage of sand and gravel produced in 1956. Pumice, stone, and clay were other nonmetals mined in the county during the year. Pickett &

Digitized by Google

Nelson operated a portable sand and gravel plant at Idaho Falls for preparation of paving and road gravel, and Clark Concrete Construction Corp. prepared sand and gravel for use in manufacturing concrete building products. Contractors supplied the Bureau of Reclamation with gravel for fill, building, and paving purposes at the Palisades project, and six contractors supplied the Idaho Department of Highways with gravel for road surfacing and maintenance. County crews and two contractors supplied the gravel requirements of the county road department.

The Gemstone Insulation Products Co. operated the Albino pumice pit 8 miles east of Idaho Falls, and Pumice, Inc., operated the Katie Lee pit near Ammon. Both companies mined and prepared pumice, which was marketed for use as concrete aggregate. Idaho Falls Pumice Co. reported production of crude pumice, which also was marketed as lightweight aggregate. Idaho Falls Brick & Tile Co. reported development work on the Rock Top pumice pit, but there was no production of pumice from this operation in 1956. The company produced heavy clay products at its Idaho Falls plant. A good demand was reported for the clay products during the year.

**Boundary.**—Exploratory work on a thorite occurrence near Porthill was carried out by Hall Mountain Thorite Co.

Morrison-Knudson Co., Inc., supplied a small quantity of basalt rubble to the Great Northern Railway Co. from a quarry operation near Bonners Ferry. Contractors supplied road gravel to the United States Army Corps of Engineers.

*Port Hill District.*—Output of lead ore by Jireh Mining Co. from the Idaho-Continental mine was reported.

**Butte.**—Sand and gravel, the only nonmetal commodity produced in the county, was supplied to the Idaho Department of Highways by two contractors.

*Dome District.*—A quantity of lead ore was shipped to the Tooele (Utah) smelter by H. W. Anderson of Arco.

**Camas.**—The Idaho Department of Highways contracted for its requirements of road-surfacing and maintenance gravel.

*Little Smokey and Carrietown District.*—The Golden Nugget mine was operated by Golden Nugget Mines & Milling, Inc., and a small quantity of gold-silver ore was produced.

**Canyon.**—Five commercial operators processed sand and gravel for building and road use in 1956. Contractors supplied the Idaho Department of Highways and the county road department with gravel for road surfacing and maintenance. County crews also dug a quantity of pit-run road gravel.

**Caribou.**—Caribou County ranked first in the State in 1956 in total value of nonmetals produced. Commodities produced, in order of output value, were phosphate rock, stone, and sand and gravel. Monsanto Chemical Co. mined phosphate rock at the Ballard surface mine for use at the company elemental phosphorus facility at Soda Springs. The company also obtained and crushed quartzite from the Bannock quarry for flux. The Anaconda Co. mined phosphate rock at the Conda mine for shipment to the company fertilizer plant at Anaconda, Mont. The No. 3 underground mine at the Conda operation was closed during the year, and a temporary shutdown of the surface pit also was reported. J. A. Terteling & Sons also mined

Digitized by Google

phosphate rock in the county during the year. Production of marketable phosphate rock in the county increased over the 1955 level.

Marion J. Hess, Fife Construction Co., and Wangsgaard Construction Co. supplied the Idaho Department of Highways with gravel for road surfacing and maintenance.

**Cassia.**—Sand and gravel output was reported from three commercial operations during 1956. Bishop Sand & Gravel Co. (Rupert) and Long Sand & Gravel Co. and Zemke Sand & Gravel Co. (both of Burley) produced sand and gravel for building, paving, and road uses. In addition, two contractors furnished gravel to the Idaho Department of Highways, and crews of the Burley highway district produced prepared and pit-run road gravel. Murtaugh highway district crews dug a quantity of pit-run gravel for road use. Burley Brick & Sand Co., Inc., mined clays for use in manufacturing heavy clay products at the Burley plant. Production from this operation was reduced from the level of the previous year.

*Black Pine District.*—Zinc ore was produced by Black Pine Mining Co.

**Clark.**—Phosphate rock and sand and gravel were the nonmetal commodities produced in the county. Initial output was recorded in August from the J. R. Simplot Co. Centennial mine in the Centennial Mountains on the Idaho-Montana border. The rock was trucked to a rail siding at Monida, Mont., for shipment to Canadian fertilizer plants. Idaho Department of Highways crews and county highway crews processed gravel for paving and road use.

*Birch Creek District.*—Don Louderbough shipped silver ore containing recoverable silver and copper from the Valley View property.

**Clearwater.**—The Idaho Department of Highways contracted for its crushed-stone requirements for road surfacing and maintenance from Wangsgaard Construction Co.; Goodfellow Bros., Inc., supplied the Bureau of Public Roads with road-surfacing gravel.

*Burnt Creek District.*—The Grub Stake mine was worked by C. E. Fread, and a quantity of silver ore was produced.

*Ruby Creek District.*—John M. Walker operated the open-pit Noah Lode mine from July 20 to September 28 and produced a small quantity of silver ore.

**Custer.**—Cordero Mining Co. reported output of 28 tons of tungsten concentrate averaging 71 percent $WO_3$ from the Wild Horse mine. About 34 tons of concentrate was sold to the Government for stockpiling.

A. D. Stanley, Boise, supplied road gravel to the Bureau of Public Roads under contract.

*Alder Creek District.*—Shipment of copper ore from the old Empire mine to the Combined Metals Reduction Co. Bauer mill in Utah was begun late in October by Idaho Alta Metals Corp., which purchased the mine in 1955. The company reported completing 1,700 feet of drifting, 110 feet of raises, 200 feet of diamond drilling, and 18,921 cu. ft. of stoping during the year. About 15 men were employed at the property. Installation of a 100-ton-per-day mill reportedly was planned. Development work was delayed earlier in the year by fire, which destroyed a compressor house and machinery. Small quantities of ore were shipped from the Blue Jay copper mine by

Digitized by Google

Charles B. Kane, and gold and lead ores were shipped by L. A. Owing and Elmer Enderlin, respectively.

*Alta District.*—Ivan I. Taylor shipped lead ore to the Midvale (Utah), smelter from the Phi Kappa lease.

*Bayhorse District.*—Clayton Silver Mines operated its Clayton mine throughout the year and produced 39,901 tons of ore, from which was obtained 2,384 tons of lead concentrate and 2,044 tons of zinc concentrate containing a total of 66 ounces of gold, 183,284 ounces of silver, 39,105 pounds of copper, 3,127,039 pounds of lead, and 2,489,016 pounds of zinc. Development work during the year totaled: Drifting, 359 feet; raises, 51 feet; and crosscuts, 556 feet. According to the company annual report, the 100-ton flotation mill ran at capacity 7 days a week. Also, the report stated that the ore reserve at the end of the year was estimated at 120,120 tons—an increase of 43 percent over the reserve at the end of 1955.

The partnership of Buchman, Breckon, & Norden reported that the Red Bird mine was operated intermittently by a lessee. Crude ore mined totaled 699 tons and development work consisted of 50 feet of raising. Floods in the early summer damaged roads and the plant and caused interruption of operations. J. F. Young operated the Young copper mine and recovered a small quantity of ore.

*East Fork District.*—The Sunshine Mining Co. annual report stated that an exploratory project at the Deer Trail mine under a DMEA contract and in cooperation with the Highland-Surprise Consolidated Mining Co. was abandoned late in the year. According to the report, extensive surface diamond drilling and bulldozing (together with underground drifting, crosscutting, and diamond drilling) failed to develop a large enough tonnage of ore to justify the high expense of building a permanent camp and constructing a mill. All equipment was removed, and the property was returned to the owners late in the year. The exploration project was begun in August of 1955.

*Yankee Fork District.*—Three lode mines and 1 placer mine were active during the year. Lead ore was shipped from the McFadden mine by Charles H. Heisen, and gold-silver ore was shipped from the Yankee Park mine by Estes Gold Mines, Inc. A. W. McGown sluiced and panned stream gravel from May 23 to September 7 and recovered a considerable quantity of gold and silver.

**Elmore.**—Sand and gravel was the only nonmetal commodity produced in the county. Wilson & Dodge processed sand and gravel for building, paving, and road uses at a fixed plant near Mountain Home. Wesley Shockley reported production of special sands for railroad use from an operation at Glenns Ferry. The Idaho Department of Highways contracted for its gravel requirements, and three contractors supplied the Mountain Home highway district with road gravel.

*Black Warrior District.*—J. Q. Wakeman recovered some gold and silver by amalgamation at the Boise River mine.

*Dixie District.*—Index-Daley Mines Co. shipped a small quantity of gold ore to the Midvale (Utah) smelter.

*Middle Boise District.*—Operations at the Talache Mines, Inc., Boise-Rochester group continued to be about the same as in 1955. A total of 3,813 tons of ore was produced. Gold-silver concentrate



Digitized by Google

was shipped to the Tacoma smelter, and gold and silver recovered by amalgamation were sold to the San Francisco mint. D. T. Seaton recovered gold and silver by amalgamation at the Golden Stringer mine between March 1 and August 1. Gold ore was produced at the Hazel Queen mine by John Rippen.

*Yuba District.*—A. Christensen reported recovering a small quantity of gold from a placer operation.

**Franklin.**—Pit-run sand and gravel for road and fill purposes was produced by Charles O. Ainscough & Sons from a pit near Preston. The Idaho Department of Highways contracted for road materials, and Franklin County Highway Department crews and contractors processed gravel for road-building and maintenance purposes.

**Fremont.**—One commercial operator reported producing a small quantity of sand and gravel for building purposes. The Idaho Department of Highways and the Bureau of Public Roads contracted for their requirements of road-building and maintenance gravel.

**Gem.**—Gravel for structural and road uses was produced by City Transfer, Emmett, and road gravel was prepared by State highway department crews and contractors for highway maintenance. Del Monte Properties, Inc., mined and processed silica sand from a deposit formerly operated by the Gem Silica Co. Special building sand was produced from this operation at a reduced rate compared with 1955.

*West View District.*—Don Elmquist shipped gold-silver ore from the Golden Sun mine.

**Gooding.**—Titus, Inc., processed sand and gravel to road and building materials at a fixed plant near Tuttle, and Gooding highway district crews produced pit-run gravel for county road use.

**Idaho.**—Production of sand and gravel was reported by five commercial operations in the county. Output that ranked the county fourth in the State in tonnage of sand and gravel produced in 1956 was utilized chiefly for paving and road use. Contractors supplied the road-gravel and crushed-stone requirements of the Idaho Department of Highways. J. F. Konen Construction Co. crushed basalt for roadstone at a quarry near Cottonwood.

*Camp Howard (Salmon River) District.*—A small quantity of gold was produced by R. E. Walling. The Lyons Bar placer was worked by Glenn Worle, and some gold and silver were recovered. Chris Martin recovered a small quantity of gold while prospecting.

*Elk City District.*—The Clearwater Dredging Co. activity on Crooked River continued during the year. A bucketline dredge, which had sixty-four 2-cubic-foot buckets, was operated from April 12 to December 4 and processed 319,848 cubic yards of gravel. The dredging permit of the company was revoked by the Idaho Land Board early in August. The action of the board reportedly was based upon the claim that the dredging company had failed to maintain a reasonable clarity downstream from its dredge. The company—contending that the law was unconstitutional because it did not establish standards of stream turbidity and because it was discriminatory in applying only to dredges handling more than 500 cubic yards of material per day—refused to recognize cancellation of the permit by the Idaho Land Board and appealed the case to the Idaho State Supreme Court.

Digitized by Google

Other placering also was reported. Lester J. Strack worked the Crooked River and Blue Moon placers from October to November with a dragline and nonfloating washing plant. Donald E. Behrens worked the Gold Point placer June 1 to November 1, using a dragline excavator and nonfloating washing plant; about 12,000 cubic yards of gravel was processed. The Johnson placer was operated by Clair Johnson during the course of assessment work, and Verel C. and Nora A. Ross sold gold and silver recovered during operations in 1955 at the Ross placer. W. J. Meyer used a long tom and pan intermittently from June to November and recovered a quantity of gold and silver while prospecting a number of placers. Walter Haldi and Alphie Claunch sold gold from the Haystack lode mine.

*Ten Mile District.*—The Silver Spur placer was operated from April to October by Frank Windmaiser.

*Warren District.*—Gold and silver recovered in 1955 at the Ole placer by Robert Newcomb and sold in 1956 were credited to State totals. A small quantity of gold ore from the Rescue mine was treated by amalgamation by Gem Mines, Inc.

**Jefferson.**—Carl E. Nelson Construction Co. produced a small quantity of road gravel for utilization by the Idaho Department of Highways, and pit-run road gravel was dug by State highway crews.

**Jerome.**—Contractors mined and processed road gravel to supply the Idaho Department of Highways and the county highway district. County highway district crews also produced prepared and pit-run gravel for road use.

*Snake River District.*—Gold was recovered from the Hard Luck and the Sunnyside placers by Dwight S. Brooks and R. E. Sherwood, respectively.

**Kootenai.**—Three companies mined and processed sand and gravel for structural, paving, and road uses, and the Chicago, Milwaukee, St. Paul, & Pacific Railroad Co. produced a quantity of railroad-ballast gravel. Idaho Department of Highways crews crushed basalt for road building and maintenance. County highway crews processed sand and gravel for road and construction work, and the United States Forest Service contracted for a supply of road gravel for forest access roads.

*Wolf Lodge District.*—Silver was shipped to The Bunker Hill Co. smelter at Kellogg from the Idaho Goldfields property by Arlie Airhart and Clyde Napier.

**Latah.**—Potlatch Forests, Inc., contracted production of crushed stone for forest access roads and three contractors crushed basalt to supply road-surfacing materials used by the Idaho Department of Highways. The A. P. Green Co. (formerly Troy Firebrick Co.) mined fire clay from an open pit near Helmer. Output, which was utilized in manufacturing refractories, was less than in 1955.

Latah County clays were intensively investigated during 1956. During the year The Anaconda Co. announced successful laboratory-scale recovery of alumina from high-alumina clays. A test plant was being constructed at Anaconda, Mont., to confirm, on a large-scale production basis, the laboratory process for producing alumina from clay. The company reportedly took large reserves of clay under option in the Moscow area in the event that the process proves to be commercially feasible. J. R. Simplot Co. extensively test-drilled and

Digitized by Google

sampled clay deposits in the Bovill area to determine if they were usable as a source of raw materials for ceramic purposes and as a filler in the manufacture of paper. A detailed review of Latah County clays was presented in a publication.[10] Aluminum-bearing clay reserves were estimated at a minimum of 250 million to a possible 500 million tons.

*Hoodoo District.*—Assessment work on the Adam Luntz placer on Poorman Creek by Clyde Thornall yielded a small quantity of gold.

**Lemhi.**—A small quantity of gravel was produced from 1 commercial operation, and 2 contractors crushed gravel to be utilized by the Idaho Department of Highways for paving and road purposes. Monroe Phippen reported development of a bentonite deposit near Salmon.

*Birch Creek District.*—Lead ore was extracted from the Worthing mine by S. S. Eldridge.

*Blackbird District.*—The Calera Mining Co. Blackbird mine was operated throughout the year and continued to be the leading domestic source of cobalt in the Nation, as well as a principal source of copper and gold in the State. Output from the mine, in a remote area south and west of Salmon, was 273,704 tons of ore, which was treated in the company 1,000-ton flotation mill; the resulting copper concentrate was shipped to the Tacoma (Wash.) smelter, and cobalt concentrate was shipped to the Calera refinery at Garfield, Utah. The company reported completing 89 feet of shaftwork, 5,418 feet of drifting, 20,482 feet of diamond drilling, and 20,674 feet of raises. Difficult ground conditions in the mine presented a major mining problem, in that it was necessary to modify the mining method used according to the particular local condition encountered. Both timbered and open stopes were employed in conjunction with a cut-and-fill mining method, using sand tailing pumped from the mill as fill.

*Blue Wing District.*—The Bradley Mining Co. Ima mine near Patterson continued to be the principal producer of tungsten in the State and one of the leading domestic sources. The company also produced a substantial quantity of sulfide concentrate containing recoverable gold, silver, copper, and lead. A total of 71,742 tons of ore, averaging 0.62 percent $WO_3$, was mined during the year—a substantial increase over the 63,400 tons produced in 1955. Output of high-grade hübnerite concentrate (71 percent $WO_3$) totaled 476 tons; and 437 tons was shipped, primarily to the Government stockpile. Scheelite-concentrate production was 29 tons, and 25 tons averaging 20 percent $WO_3$ was shipped to the Salt Lake Tungsten Co., Salt Lake City, Utah. Sulfide concentrate totaling 2,420 tons was shipped to the Selby (Calif.) smelter. A 150-ton flotation-gravity mill was used; however, facilities for re-treatment of tailing, added to mill equipment in 1955, were not operated in 1956.

*Eureka District.*—Mel Parks and Gunderson & Mays loaded and shipped a considerable quantity of old copper tailing from the Pope Shenon mine. Old tailing from the mine also was shipped by Hugh B. Hublinger. The Grandview mine was worked by Rulon Young. Ore containing recoverable gold, silver, and copper was shipped.

[10] Work cited in footnote 8.

Digitized by Google

*Eldorado District.*—Don Smith and partners worked the Hungry Hill mine for a few days during the summer and shipped 1 truckload of copper ore.

*Junction District.*—Lead ore was extracted from the Brown Bear mine by Frank Proul.

*McDevitt District.*—Copper ore was produced by Big Four Mines & Trust Association and by Robertson & Steeples at the Big Four and Grandview mines, respectively.

*Nicholia District.*—Joe E. Zook produced 5 tons of lead ore from the Nicholia mine between July and November, and Edward Anderson shipped old slag containing recoverable silver, lead, and zinc from the Nicholia smelter dump.

*Texas District.*—Lead-zinc ore was shipped from the Hill Top and Rainbow mines by Rosebud Mining Co. and Joe E. Zook, respectively. The United Idaho mine was operated by Roger Pierce, and 1 truckload of lead ore was shipped.

*Yellow Jacket District.*—The Yellow Jacket placer claim was worked by Herb S. Steen, and a small quantity of gold was recovered.

**Lewis.**—Limestone and sand and gravel were the only mineral commodities produced in the county. Lewiston Lime Co. quarried and crushed limestone, which was used chiefly by paper plants, sugar refineries, and metallurgical works. Crews of the Perry highway district processed gravel for road use.

**Lincoln.**—Gravel (the only mineral commodity produced in the county during 1956) was prepared by C. C. Metts of Gooding for paving and road purposes. A. D. Stanley Construction Co. contracted to supply the Idaho Department of Highways with gravel for road surfacing and maintenance.

**Madison.**—George Garner & Sons, Rexburg, produced sand and gravel for road use, and contractors supplied road gravel to the Idaho Department of Highways and the Madison County Highway Department. County highway crews operated crushers to supply stone for constructing and maintaining county roads.

**Minidoka.**—The only mineral production in the county reported during 1956 was a small quantity of gravel and crushed basalt utilized by the Bureau of Reclamation at its Minidoka project.

**Nez Perce.**—A report published during the year described mineral deposits in the county and emphasized the possible importance of its large reserves of industrial minerals.[11]

Asphalt & Paving Co. of Lewiston produced gravel for road use, and Dunclick, Inc., also of Lewiston, processed sand and gravel for building and road materials. Hugh P. Terteling produced special high-quality sand for plaster, masonry, blast, and filter purposes from an operation near Genesee. Installation of a rod mill for use in preparing glass and foundry sands was planned. Two contractors supplied crushed road gravel for the Idaho Department of Highways.

**Owyhee.**—E. N. Bennett of Payette reported producing a small quantity of bentonite from the Ben-Jel mine near Oreana. Quinn-Robbins Co., Inc., contracted to supply the road gravel requirements of the Idaho Department of Highways in the area during 1956.

[11] Hubbard, Charles R., Geology and Mineral Resources of Nez Perce County: Idaho Bureau of Mines and Geology, County Rept. 1, August 1956, 17 pp.

Digitized by Google

*Carson or French District.*—A small quantity of gold and silver was recovered by Florida Mountain Joint Venture from the Ontario placer. The Blue Gravel placer was worked from April to October by Charles Andrus and Bob Lawrence.

*South Mountain District.*—Copper-lead-zinc concentrate was produced and shipped from the South Mountain property by South Mountain Mining & Concentrating Co.

**Payette.**—Sand and gravel was prepared by the Logsdon Sand & Gravel Co. for building and construction uses, and the Idaho Department of Highways contracted for road gravel. The Jensen Brick Co., Payette, reported its pit and clay plant idle during the year.

**Power.**—A quantity of sand and gravel for building purposes was the only mineral commodity reported produced in the county during 1956.

**Shoshone.**—The value of metals produced in the county remained about the same as in the preceding 3 years, with gold, copper, and lead making nominal increases and silver and zinc declining somewhat. Mining in the county accounted for over 60 percent of the total value of minerals produced in the State, and the county continued to be a leading domestic source of lead, zinc, silver, and antimony. In 1956 The Bunker Hill Co. was the district's largest producer, with nearly half of the total tonnage of ore mined. Three companies (The Bunker Hill Co.—Bunker Hill and Star mines; American Smelting & Refining Co.—Page, Morning, Frisco, and Galena mines; and Sunshine Mining Co.—Sunshine, Polaris, Silver Dollar, Silver Syndicate, and Sunshine Consolidated properties) furnished about 83 percent of the district ore production. Significant tonnages also were produced from the Dayrock, Silver Summit, Sidney, and Lucky Friday mines.

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in the Coeur d'Alene region, Shoshone County, 1947–51 (average), 1952–56, and total 1884–1956, in terms of recoverable metals**

| Year | Mines producing | | Material sold or treated (short tons) | Gold, lode and placer (fine ounces) | Silver, lode and placer (fine ounces) |
|---|---|---|---|---|---|
| | Lode | Placer | | | |
| 1947–51 (average) | 62 | 3 | 2,668,329 | 2,942 | 11,535,066 |
| 1952 | 58 | 2 | 2,327,536 | 2,476 | 13,752,081 |
| 1953 | 43 | ------- | 1,788,426 | 2,376 | 13,636,680 |
| 1954 | 37 | ------- | 1,630,250 | 2,047 | 14,898,699 |
| 1955 | 41 | ------- | 1,637,121 | 1,777 | 12,984,323 |
| 1956 | 36 | 2 | 1,674,781 | 2,782 | 12,663,214 |
| 1884–1956 | ------- | ------- | (1) | 419,232 | 55,7,897,750 |

| Year | Copper (short tons) | Lead (short tons) | Zinc (short tons) | Total value |
|---|---|---|---|---|
| 1947–51 (average) | 1,528 | 79,013 | 79,703 | 58,342,129 |
| 1952 | 1,862 | 67,330 | 70,316 | 58,459,368 |
| 1953 | 2,100 | 69,885 | 68,650 | 47,729,814 |
| 1954 | 2,566 | 64,812 | 58,736 | 45,515,124 |
| 1955 | 2,637 | 59,820 | 50,527 | 44,036,867 |
| 1956 | 2,889 | 60,221 | 46,738 | 45,729,474 |
| 1884–1956 | 85,059 | 6,249,201 | 1,890,347 | 1,656,106,674 |

[1] Complete data not available; 1904–56, 99,630,902 short tons.

Digitized by Google

A strike of members of the International Union of Mine, Mill & Smelter Workers, which began on August 24, 1955, and seriously affected the 1955 production totals, continued until early February. This strike halted output from the mines and mills of the 16-operator bargaining group, and about 850 workers were idled. The strike was settled when a new contract was accepted that called for substantial wage increases, more liberal vacation provisions, a seventh paid holiday, strengthened union security, weekly paydays, improved and broadened health and welfare benefits, and recognition of union stewards. The wage increases (which were retroactive to July 1, 1955) ranged from $13.67 to $14.58 per 8-hour shift at the bottom of the grading system and $17.03 to $18.18 at the top. Provision also was made for upgrading the positions of a number of classes of miners and plant workers. The 2,500 employees of The Bunker Hill Co. were covered under a 3-year contract signed in November. Provisions of the contract were similar to the agreement reached earlier by the 16-operator group, with the addition of a provision for a combined life insurance and savings plan paid for jointly by employees and the company.

One of the newer innovations in mining techniques was introduced into the Coeur d'Alene mining area by the American Smelting & Refining Co. at the Galena mine.[12] Ground supports, consisting of arch or ring sets of U-shaped rolled-steel segments heavily flanged to resist torsion and designed to nest into one another at points of overlap where they are clamped together with heavy U-bolts, were installed in the main haulageway on the 3,000 level of the mine. The design of the supports permits yielding under heavy pressures, relieving the load without damaging the supports.

The Bunker Hill Co. lead smelter and electrolytic zinc plant west of Kellogg continued to process material from domestic and foreign sources. According to the company annual report, records for the lead smelter were broken for the second consecutive year in both lead production and sales. Production of lead from the smelter for the year totaled 101,714 tons, and sales were 96,391 tons of lead, 17,500 tons of zinc in fume, 103,461 pounds of cadmium, 4,932,098 ounces of silver, 317 tons of antimony, 729 tons of copper, and 7,520 ounces of gold. A slight decline in the sales of zinc in fume was attributed to a 6-week shutdown of the slag-fuming plant to effect extensive renovations.

Many improvements in equipment were effected during the year, and a new straight-line ingot-casting machine and a copper-enrichment furnace were placed in operation. Ingot-casting capacity was increased from 3 tons to 15 tons per man-shift by installation of the new casting machine. Production of 97- to 98-percent blister copper was made possible with the copper-matte enrichment furnace.

At the Bunker Hill electrolytic zinc plant, production again exceeded all past records, according to the company report. Maximum production from four electrolytic-cell units was maintained without serious interruption, and construction work was continued on the new fifth and sixth electrolytic units. Output totaled 57,799 tons of high-grade zinc and 467,091 pounds of cadmium, and sales totaled 51,432

[12] Inland Empire Miner, Dec. 25, 1956.

Digitized by Google

tons of zinc and 434,094 pounds of cadmium. The sulfuric acid plant operated at about 50 percent of capacity throughout the year. Nearly 46,000 tons of salable acid was produced.

*Beaver District.*—Five Day Mines, Inc., properties were operated for varying periods by lessees during the year. Ore was taken from the Mountain Goat, Silver Tip, Sitting Bull, Sunset Lease, and Tuscumbia workings. The bulk of the material was derived from Korsage-Smith subleases on the Silver Tip mine and Sunset Lease, from Kennedy & Zanetti lease operations on the Mountain Goat property, and from the Zanetti Bros. sublease on the Sunset deposit. Ore was processed at the Rex mill and at the Golconda Lead Mines mill. The Sunset Lease (70 percent owned by Day Mines, Inc.) yielded 5,829 tons of milling ore averaging 1.5 ounces silver per ton, 3.2 percent lead, and 4.5 percent zinc, according to the annual company report.

*Eagle District.*—Gordon Hess worked the Kleppinger Fraction placer claim for 2 months and recovered a small quantity of gold and silver.

*Evolution District.*—Output from the Sunshine Mining Co. Sunshine mine and adjoining properties (operated by Sunshine on a profit-sharing basis) dropped for the second consecutive year. Ore mined and milled totaled 200,028 tons with an average grade of 26.30 ounces of silver per ton and 1.29 percent lead, according to the company annual report. Output from the several areas was: Sunshine, 28,583 tons; Omega, 80,850 tons; Rambo, 22,690 tons; Rotbart, 47,331 tons; Suncon, 18,820 tons; and Yankee Girl, 1,484 tons. The estimated ore reserve of the company was reported to have declined by 120,000 tons to a total of 439,000 tons. About 80,000 tons of new ore was developed as compared with 200,000 tons mined. Development for the year totaled 190 feet of shaft work, 6,256 feet of drifting, 3,104 feet of raises, and 1,018 feet of crosscuts. An average of 331 underground shifts daily was worked in 1956 as compared with 383 in 1955.

The company 1,200-ton flotation mill operated 250 days and produced 5,715 tons of lead-silver concentrate, 3,195 tons of copper-silver-antimony concentrate, and 156 tons of silver-pyrite concentrate. The total of metals contained in concentrates was 4,996,044 pounds of lead, 1,909,254 pounds of copper, and 5,127,617 ounces of silver.

With minor exceptions, all departments operated on a 5-day work schedule during the year.

The company entered into an agreement with Bradley Mining Co. in June for the sale of an accumulated stockpile of electrolytic antimony metal. By the end of the year, 3,519,031 pounds of the metal containing 3,343,079 pounds of antimony had been shipped to the Bradley smelter at Stibnite.

Polaris Mining Co., which owned and mined the Silver Summit property and, with a 59-percent interest, operated the New Purim area (participating in income and costs with Silver Dollar Mining Co.), reported treating 50,806 tons of silver ore in its 300-ton plant. The company completed 4,231 feet of drifting, 11,851 feet of diamond drilling, 1,270 feet of raises, and 582 feet of crosscuts. The company also owned a one-half and one-third interest, respectively, in the Omega and Rotbart areas operated by Sunshine Mining Co. In its annual

Digitized by Google

report for 1956, the Polaris concern reported that the reserve in the Silver Summit and New Purim areas was 26,996 tons assaying 34.28 ounces of silver and 0.81 percent copper. Production was 45,336 tons assaying 20.71 ounces of silver and 0.49 percent copper.

The Polaris company continued work on its East Exploration Project during the year. The project, consisting of a lateral driven from the Silver Summit shaft eastward through adjoining properties under a profit-sharing agreement, was being financed with DMEA assistance. The main heading of the project was advanced 2,173 feet during the year, and areas north and south of the lateral were explored, with a total of 8,210 feet of diamond drilling.

Concentrate produced by Zanetti Bros. from lead-zinc old tailing from the DeBlock tailing deposit was received at the Bunker Hill smelter; the material contained substantial quantities of silver, lead, and zinc, as well as some gold and copper.

*Hunter District.*—Output from The Bunker Hill Co. Star mine declined somewhat in 1956, owing to a series of breakdowns during the summer. About 1 month of production was lost. A total of 189,821 tons of ore from the mine was milled; gross metal content of the ore was 14,172,000 pounds of lead, 26,648,000 pounds of zinc, and 207,017 ounces of silver. The mine reserve declined from 1,476,340 tons at the end of 1955 to 1,372,684 tons at the end of 1956, according to the company annual report. The company reported completion of 2,813 feet of drifting, 4,107 feet of diamond drilling, 2,352 feet of raises, and 805 feet of crosscuts. A cut-and-fill mining method was used.

Golconda Lead Mines produced 4,400 tons of ore from the Golconda mine and completed 375 feet of raising and 320 feet of drilling, as well as major timber repairs to the main adit tunnel and a new connection to the main ventilation raise, according to the company annual report. The mine and mill were closed until early February by the strike of the International Union of Mine, Mill & Smelter Workers. The company reported that high labor and supply costs reduced the profitable ore reserve to a minimum and that future mining operations would be on a severely curtailed basis. The Golconda mill treated 54,000 tons of custom ores during its 10½-month operating period, with the bulk of the ore treated coming from the Lucky Friday mine. Ore from the company Golconda mine yielded 255 tons of lead concentrate and 347 tons of zinc concentrate containing a total of 5 ounces of gold 13,153 ounces of silver, 2,646 pounds of copper, 369,377 pounds of lead, and 410,859 pounds of zinc.

Lucky Friday Silver Lead Mines Co. reported that 41,457 tons of ore from the Lucky Friday mine was milled in the Golconda mill during the year; 5,125 tons of lead concentrate and 496 tons of zinc concentrate with a gross metal content of 400 ounces of gold, 722,246 ounces of silver, 180,818 pounds of copper, 7,005,934 pounds of lead, and 1,262,006 pounds of zinc were produced. Exploration at the mine, one of the newer and more successful developments in the county, totaled 288 feet of shaft work, 1,180 feet of drifting, 315 feet of tunneling, 839 feet of diamond drilling and 687 feet of raises. A shaft-deepening project was begun at the mine in the latter part of the year using a Cryderman shaft mucker, a recent development in sinking equipment. It was planned to extend the shaft to the 3,000 level.

Digitized by Google

American Smelting & Refining Co. milled 45,946 tons of ore from its Morning mine in the 1,250-ton flotation mill on the property. The company reported completing 587 feet of drifting, 94 feet of raises, and 75 feet of crosscuts. Prospects for future activity at the old mine, the lower levels of which were closed late in 1953 owing to declining lead-zinc prices, increased costs, and decreasing ore reserve, received a boost late in the year when a new ore strike was made on the Noonday vein on the 1,250 level. The Morning mine was reported as employing 150 men and yielding 200–250 tons of ore per day from the upper levels. Work in the mine was confined to salvage operations following the cessation of large-scale production in 1953. A substantial quantity of lead-zinc old tailing was recovered from a creek bed by Chester Uhl and milled at the Golconda mill.

*Lelande District.*—The American Smelting & Refining Co. Frisco mine, closed in January by the strike that affected operations at a number of the district's producers, was operated the remaining 11 months of the year and yielded 42,253 tons of ore, which was treated at the Morning mill. An announcement by the company late in the year stated that the mine would be closed indefinitely on December 31 owing to increasing mining costs and lower prices for lead and zinc. The company reported a total of 661 feet of drifting and 53 feet of crosscutting during the year.

Operations at the Frisco mine dated back to 1884, when it was located as the Helena-Frisco mine. The property had been operated continuously since 1942 by the American Smelting & Refining Co. or its subsidiary, Federal Mining & Smelting Co. The 80 employees working at the mine were to be moved to other plants of the company in the district. Company officials reported that the principal ore body on the Frisco vein was smaller on each successive lower operating level.

The Hull lease on the Frisco mine also was operated 11 months of the year. A total of 6,603 tons of ore was produced.

Ore was produced from the Day Mines, Inc., Hercules and Sherman properties. Ore from the Hercules mine was treated at the Burke 300-ton flotation mill. The company reported completing 406 feet of drifts, 312 feet of diamond drilling, and 1,078 feet of raises. According to the company annual report, Hercules mine development and stope preparation continued through 1956, and a new DMEA contract was approved late in the year to sink a winze from the west 1,600 level and open a new 1,900 level on the Rambler vein. Work on the project was to begin in 1957.

Heidt & Siers, lessees, were active at the company Sherman mine. Work was confined to cleaning up pillars and old workings. The company stated in its annual report that "A small tonnage produced by a lessee from the Sherman mine finished all expected mining at this once rich property." The Benton Mine Syndicate shipped a small quantity of crude ore from the Benton mine during the summer.

*Placer Center District.*—American Smelting & Refining Co. operated the Galena mine from February through December; 87,925 tons of ore was milled. Exploration and development work done in the mine comprised drifting, 372 feet; crosscutting, 582 feet; raises, 1,101 feet; winze sinking, 168 feet; and diamond drilling, 1,994 feet. The Galena mine leased from Vulcan Silver Lead Co. by American Smelting & Refining Co. (75-percent interest) and Day Mines, Inc. (25-percent

Digitized by Google

interest), produced at approximate mill capacity through the last 3 quarters of 1956. Output was chiefly silver-copper ore, although a small tonnage of lead-silver ore from development work was milled separately.

During 1956 the Callahan shaft was deepened to the 2,400 level and connected to the Silver vein workings at 2,200 and 2,400 levels. A hoistroom was excavated, and hoisting facilities for the new service shaft were to be installed early in 1957. A winze to explore the Silver vein from the 3,400 to the 4,000 levels also was begun in 1957. The company previously had invested considerable time and money in enlarging the old main Galena shaft from the collar to the 1,000 level and deepening it an additional 2,000 feet to reach deep-seated ore bodies that were proved to exist beneath old workings in which the ore had pinched out at a depth of about 1,600 feet. Ore production from the new development was begun in 1955.

Day Mines, Inc., operated its Dayrock mine 11 months of the year. A modified cut-and-fill method of mining, with sand filling of stopes, was employed. The company reported completing 1,315 feet of drifts and 783 feet of raises. Ore was treated in the company 250-ton flotation plant. The company reported that Dayrock-mine development included an extension of the 500-level Freeman vein and completion of the 1,100 drift on the Ohio vein. A new vein (probably the California) was partly developed on the 1,100 level. Late in 1956 preparations were made for deepening the Dayrock shaft for a new 1,250 level. The Day Mines Tamarack mine was active from February 6 to December 31. The company reported that the Tamarack mine, operated mainly by leasing, produced 26,837 of zinc-lead-silver milling ore, which was milled in the company-operated concentrator. Development included 103 feet of drifts and 396 feet of raises.

*Union District.*—A small quantity of gold was recovered from old tailing on Pritchard Creek by Emil Bowen.

*Yreka District.*—The rate of extraction of ore from the Bunker Hill mine again set a new record for tons mined, even though a strike in May caused a material loss in tonnage for that month, according to The Bunker Hill Co. annual report. The report also stated that metal production was lower than in 1955, due to mining of lower grade ores. A total of 531,334 tons of ore from the mine was milled, and metals recovered were: Lead, 31,555 tons; zinc, 10,686 tons; and silver, 2,028,535 ounces. The ore reserve at the end of 1956, as shown in the company report, was 3,103,126 tons, the highest at any time in the preceding 10 years. Ore was milled in the Bunker Hill 2,500-ton flotation mill. Exploration and development during the year totaled 14,135 feet of drifting, 1,265 feet of raises, and 4,452 feet of diamond drilling.

At the company Crescent mine, a DMEA contract was completed. The company annual report stated that development work produced 2,411 tons of ore, from which 18,051 ounces of silver was recovered. A raise from the 3,200- to the 2,400-foot level was started to develop a series of ore shoots encountered near the east end of the Alhambra fault.

The large John George leasing operation in the old upper workings of the Bunker Hill mine was purchased on March 13 by Frank N.

Digitized by Google

Marr and rehabilitation of the underground workings and the mill was undertaken. About 25 men were employed.

Production during 11 months of operation at the American Smelting & Refining Co. Page mine was 109,586 tons of ore. Ore was milled in the company 500-ton flotation plant. The company completed 190 feet of shaftwork, 1,351 feet of drifts, 1,144 feet of raises, and 896 feet of crosscuts and employed one of the new Cryderman shaft muckers to deepen the main shaft.

Sidney Mining Co. reported production of 38,847 tons of ore from the Sidney mine. The company completed 1,897 feet of drifting, 3,686 feet of diamond drilling, and 142 feet of raises. The gross metal content of ore produced was 83,710 ounces of silver, 3,783,697 pounds of lead, and 7,846,605 pounds of zinc.

Lead-zinc ore from the Liberal King mine, operated by Sunset Mines, Inc., and leasers, was treated in the company 100-ton flotation mill. Completion of 2,867 feet of diamond drilling was reported, and a total of 6,436 tons of ore was milled.

Jim Doyle sold concentrate obtained during the course of cleanup operations at the Highland-Surprise, Douglas, Constitution, Amy Matchless, and Sidney mills. The Highland-Surprise mine was not operated during the year. Nabob Silver-Lead Co. produced lead and zinc concentrates from development ore extracted during winze-sinking operations at the Nabob mine. The work was being done under a DMEA contract.

**Teton.**—Sand and gravel, dug and processed for road materials, was the only mineral commodity produced in the county during 1956. Contractors supplied road, paving, and surfacing materials to the Idaho Department of Highways and the Bureau of Public Roads. A small quantity of pit-run sand and gravel for road use was dug by the State highway crews.

**Twin Falls.**—Production of 781,000 tons of sand and gravel enabled the county to rank second in the State in output of this commodity during 1956. Six commercial operations processed sand and gravel for building and road purposes, and Niesen & Smith Construction Co. under contract, supplied the road-gravel requirements of the Idaho Department of Highways. The Twin Falls highway district contracted for a supply of road gravel, and district highway crews dug pit-run gravel for utilization on county roads. Buhl and Filer highway district crews also produced road gravel. The principal commercial sand and gravel producers in the county during the year were Idaho Rock, Inc., and Twin Falls Construction Co., both of Twin Falls; McCarty Gravel Co., Kimberly; and Sumner Sand & Gravel Co., Buhl.

**Valley.**—Porter Bros. Corp. began dredging in Bear Valley on the upper reaches of the Salmon River early in the year. Columbium-tantalum concentrate was produced. Mercury output at the old Hermes mine, renamed the Cinnabar mine, was continued by Holly Minerals. A fire in the surface plant in August halted all operations for the remainder of the year. The company reported that ore blocked out in the mine contained an estimated 5,000 flasks of mercury.

Bradley Mining Co. reactivated its antimony smelter at Stibnite to upgrade for sale to the Government stockpile about 2,000 tons of electrolytic antimony metal purchased from Sunshine Mining Co.

Digitized by Google

Arsenic was the chief impurity to be removed. The crushing and concentrating units of the smelter were to be dismantled and sold. McRae Tungsten Corp. extracted 1,704 tons of tungsten ore averaging 0.65 percent $WO_3$ from the Snowbird mine. High-grade concentrate was shipped to the Government stockpile, and low-grade concentrate was shipped to Salt Lake Tungsten Co.

*Thunder Mountain District.*—Mill cleanup work by Jack Kittock yielded a few ounces of gold.

**Washington.**—Rare Metals Corporation of America completed its first full year of operation at the Idaho-Almaden open-pit mine near Weiser—the largest of two mercury producers in the State. The company estimated that ore blocked out contained over 1.7 million pounds of mercury. Inoco Ore Corp. shipped a quantity of iron ore from workings on Iron Mountain near Weiser.

The Rock Creek gypsum mine, 20 miles northwest of Weiser, was reported inactive during 1956. In previous years gypsum had been mined from the deposit for use as fertilizer and soil conditioner.

Digitized by Google

Digitized by Google

# The Mineral Industry of Illinois

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels between the Bureau of Mines, U. S. Department of the Interior, and the Illinois State Geological Survey.**

By Matthew G. Sikich [1]

MINERAL output in Illinois in 1956 was valued at $572 million—an increase of over 7 percent above 1955. The principal factors were greater consumption of coal, chiefly by electric-power utilities, and greater demand for sand and gravel and stone for the accelerated highway program and other heavy-construction activities. Marked increases in total values of production over 1955 were reported for coal, fluorspar, natural-gas liquids, petroleum, sand and gravel, stone, and zinc. Other commodities produced in 1956 increased in values of output, except lead, silver, and elemental sulfur.

Mineral fuels continued to be the major commodity group, constituting over three-fourths of the total value of mineral production in the State in 1956. Nonmetals as a group supplied one-fifth of the total value, and metals furnished the remainder.

**TABLE 1.—Mineral production in Illinois, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Cement: | | | | |
| Portland ..... 376-pound barrels | 8,654,735 | $22,886,351 | 8,629,432 | $24,866,396 |
| Masonry ..... do | 742,363 | 2,145,170 | 671,757 | 2,397,398 |
| Clays | 2,338,579 | 3,978,972 | 2,257,875 | 4,005,440 |
| Coal [2] | 45,932,114 | 167,937,815 | 48,102,041 | 184,677,877 |
| Fluorspar | 166,337 | 7,838,471 | 178,254 | 8,469,450 |
| Lead (recoverable content of ores, etc.) | 4,544 | 1,354,112 | 3,832 | 1,203,248 |
| Lime | 644,181 | 9,416,136 | (3) | (3) |
| Natural gas ..... million cubic feet | 8,033 | 1,036,000 | 6,177 | 933,000 |
| Peat | (3) | (3) | 14,451 | 157,573 |
| Petroleum (crude) ... thousand 42-gallon barrels | 81,423 | 236,940,000 | 82,346 | 241,274,000 |
| Sand and gravel [4] | 26,362,360 | 28,138,973 | 31,238,583 | 33,254,379 |
| Silver (recoverable content of ores, etc.) troy ounces | 3,075 | 2,783 | 1,580 | 1,430 |
| Stone | 28,865,724 | 35,621,394 | 31,854,984 | 40,859,248 |
| Zinc (recoverable content of ores, etc.) | 21,700 | 5,338,200 | 24,039 | 6,586,686 |
| Value of items that cannot be disclosed: Natural-gas liquids, elemental sulfur, tripoli, and values indicated by footnote 3 | | [5] 12,666,081 | | 26,047,811 |
| Total Illinois [6] | | [5] 533,062,000 | | 572,321,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Exclusive of mines producing less than 1,000 net tons.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Includes friable sandstone.
[5] Revised figure.
[6] Total has been adjusted to eliminate duplicating value of clays and stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.



Digitized by Google

Many ores contain valuable minor constituents, such as cadmium, gallium, and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to the mine of origin. These minor constituents are recovered at plants frequently treating mixtures of materials from many sources, including residues from the refining of such metals as zinc, lead, etc. In many such instances distribution of mineral products by States of origin is impossible, and an accurate separation as to domestic and foreign sources may be difficult to obtain. The valuable byproduct sulfuric acid usually cannot be separated as to source.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Coal.**—Illinois, continuing as one of the major coal-producing States, ranked fourth in the Nation. Approximately 48.1 million tons of bituminous coal valued at nearly $185 million, was produced in the State in 1956; quantity increased 5 percent and value, 10 percent over 1955. Average mine value per ton in 1956 was $3.84 compared with $3.66 the previous year. The principal market outlets for Illinois coal were industrial plants and electric-power utilities. A substantial quantity was sold for local consumption. Sales to railroads continued to decline.

Output was reported from 175 mines in 36 counties. The major producing counties, in order of decreasing tonnage, were Williamson, Christian, Fulton, Perry, Franklin, St. Clair, and Saline. The following companies reported producing over 1 million tons of coal in Illinois: Bell & Zoller Coal Co., Carmac Coal Co., Chicago, Wilmington & Franklin Coal Co., Fairview Collieries Corp., Freeman Coal Mining Corp., Midland Electric Coal Corp., Old Ben Coal Corp., Peabody Coal Co., Perry Coal Co., Sahara Coal Co., Inc., Southwestern Illinois Coal Corp., Stonefort Corp., Truax-Traer Coal Co., Union Colliery Co., and The United Electric Coal Cos. The Peabody No. 10 underground mine in Christian County was the leading producing bituminous-coal mine in the United States in 1956.

Approximately 59 percent of the total production came from underground mines and the remainder from strip pits—about the same percentage breakdown as in 1955. Coal was crushed and/or treated at 86 mines in 1956. About 86 percent of the State output was mechanically cleaned at 61 plants.

**Peat.**—Production of peat in Illinois increased to 14,451 net tons valued at $157,573. Output was reported by three producers in Cook, Lake, and Tazewell Counties. All peat produced in the State in 1956 was used as a soil conditioner.

**Petroleum, Natural Gas, and Natural-Gas Liquids.**—Crude-petroleum output in Illinois increased slightly in both quantity and value over 1955, chiefly because of secondary recovery practices. Waterflooding and hydraulic-fracture treatment had been important factors in reversing the downward trend of oil output in 1953 and later helped to sustain production. At the end of 1956 approximately 31,000 oil wells were producing in the State.[2]

[2] Illinois Department of Mines and Minerals, Division of Oil and Gas, Seventy-fifth Coal Report: 1956, p. 10.

Digitized by Google

**TABLE 2.—Bituminous coal production, value, and number of mines operated in 1956, by counties**

(Exclusive of mines producing less than 1,000 net tons)

| County | Production (net tons) | | | Value | | Number of mines operated | | |
|---|---|---|---|---|---|---|---|---|
| | Underground | Strip | Total | Average per ton | Total | Underground | Strip | Total |
| Bureau | | 765,398 | 765,398 | $4.24 | $3,245,288 | | 1 | 1 |
| Christian | 5,725,068 | | 5,725,068 | 3.42 | 19,575,794 | 2 | | 2 |
| Clinton | 162,591 | | 162,591 | 3.92 | 637,705 | 3 | | 3 |
| Douglas | 386,915 | | 386,915 | 4.33 | 1,677,170 | 1 | | 1 |
| Franklin | 4,745,077 | | 4,745,077 | 4.26 | 20,208,174 | 4 | | 4 |
| Fulton | 66,425 | 5,296,651 | 5,363,076 | 3.86 | 20,720,321 | 6 | 13 | 19 |
| Gallatin | 109,960 | 116,587 | 226,547 | 2.98 | 675,250 | 4 | 9 | 13 |
| Greene | | 5,108 | 5,108 | 5.09 | 26,019 | | 1 | 1 |
| Grundy | | 217,991 | 217,991 | 4.86 | 1,058,879 | | 1 | 1 |
| Hancock | | 28,691 | 28,691 | 6.36 | 182,490 | | 1 | 1 |
| Henry | 88,852 | | 88,852 | 4.50 | 399,653 | 3 | | 3 |
| Jackson | 663,521 | 591,803 | 1,255,324 | 3.61 | 4,529,949 | 3 | 4 | 7 |
| Jefferson | 2,654,179 | | 2,654,179 | 4.08 | 10,831,249 | 1 | | 1 |
| Johnson | | (1) | (1) | (1) | (1) | | 1 | 1 |
| Kankakee | | 621,087 | 621,087 | 4.86 | 3,017,026 | | 1 | 1 |
| Knox | | (1) | (1) | (1) | (1) | | 4 | 4 |
| La Salle | | (1) | (1) | (1) | (1) | | 2 | 2 |
| Livingston | | 2,595 | 2,595 | 8.76 | 22,735 | | 1 | 1 |
| Logan | 13,602 | | 13,602 | 6.61 | 89,969 | 1 | | 1 |
| Macoupin | 327,965 | | 327,965 | 3.92 | 1,285,582 | 3 | | 3 |
| Madison | 1,075,843 | | 1,075,843 | 3.86 | 4,149,416 | 4 | | 4 |
| Marion | 9,050 | | 9,050 | 3.72 | 33,653 | 1 | | 1 |
| Menard | 14,715 | | 14,715 | 6.26 | 92,187 | 3 | | 3 |
| Montgomery | 1,678,543 | | 1,678,543 | 4.26 | 7,143,862 | 1 | | 1 |
| Peoria | 32,024 | 393,054 | 425,078 | 4.30 | 1,829,829 | 7 | 5 | 12 |
| Perry | 1,166,613 | 3,694,565 | 4,861,178 | 3.62 | 17,621,732 | 3 | 5 | 8 |
| Randolph | 933,601 | 114,735 | 1,048,336 | 3.67 | 3,848,062 | 3 | 2 | 5 |
| St. Clair | 2,355,126 | 1,616,025 | 3,971,151 | 3.39 | 13,469,188 | 6 | 3 | 9 |
| Saline | 1,948,213 | 1,081,694 | 3,029,907 | 3.75 | 11,347,675 | 4 | 9 | 13 |
| Sangamon | 109,205 | | 109,205 | 3.20 | 349,312 | 2 | | 2 |
| Schuyler | 12,281 | 7,574 | 19,855 | 5.49 | 109,103 | 2 | 2 | 4 |
| Tazewell | 3,100 | | 3,100 | 5.07 | 15,717 | 1 | | 1 |
| Vermilion | 65,184 | 929,709 | 994,893 | 4.24 | 4,220,121 | 4 | 2 | 6 |
| Washington | 25,315 | | 25,315 | 4.73 | 119,796 | 2 | | 2 |
| Will | | 155,154 | 155,154 | 5.50 | 853,534 | | 1 | 1 |
| Williamson | 4,053,737 | 2,377,223 | 6,430,960 | 3.86 | 24,821,723 | 20 | 17 | 37 |
| Undistributed | | 1,659,692 | 1,659,692 | 3.90 | 6,469,714 | | | |
| Total | 28,426,705 | 19,675,336 | 48,102,041 | 3.84 | 184,677,877 | [2] 92 | [2] 83 | [2] 175 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Total has been adjusted to eliminate duplicating mine count for operations extending into 2 counties.

Production of natural gas in the State decreased 23 percent in quantity and 10 percent in value below 1955. Output of natural-gas liquids in Illinois increased 7 percent in quantity and 29 percent in value over the preceding year.

## NONMETALS

**Cement.**—The total value of shipments of portland and masonry cements from Illinois plants increased 9 percent over 1955, although the total quantity decreased slightly below the preceding year. Four cement plants were operated in the northern part of the State, in La Salle and Lee Counties.

The total annual finished-cement capacity for the State was approximately 9.1 million barrels. Nearly 207 million kw.-hrs. of electrical energy were used; approximately 86 percent of the power was generated by the cement companies, and the remainder was purchased. The cement companies quarried and used about 2.5 million tons of limestone in producing portland cement in Illinois.

465877—58——26

Digitized by Google

**Clays.**—Total quantity of clays produced in 1956 decreased about 3 percent below 1955, whereas the total value increased slightly over that in the previous year. Fire-clay output was reported by 12 producers in Brown, Greene, Grundy, La Salle, McDonough, Madison, and Rock Island Counties. Material was used for refractory purposes, stoneware, and heavy clay products.

Miscellaneous clay was produced in 24 Illinois counties in 1956 and used principally for manufacturing brick and other heavy clay products. Smaller quantities were used for manufacturing cement, lightweight aggregate, art pottery, and oil and grease absorbent.

**TABLE 3.—Finished portland cement produced and shipped, 1947–51 (average) and 1952–56**

| Year | Active plants | Production (barrels) | Shipments from mills | | |
|---|---|---|---|---|---|
| | | | Barrels | Value | |
| | | | | Total | Average per barrel |
| 1947–51 (average) | 4 | 7,866,760 | 7,788,202 | $16,367,816 | $2.10 |
| 1952 | 4 | 8,514,443 | 8,710,621 | 20,600,347 | 2.36 |
| 1953 | 4 | 8,869,342 | 8,651,385 | 21,961,761 | 2.54 |
| 1954 | 4 | 8,841,848 | 9,109,076 | 23,147,871 | 2.54 |
| 1955 | 4 | 8,809,655 | 8,654,735 | 22,886,351 | 2.64 |
| 1956 | 4 | 8,822,611 | 8,629,432 | 24,866,396 | 2.88 |

**TABLE 4.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds**

| Year | Fire clay | | Miscellaneous clay | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 414,412 | $1,313,350 | 1,980,440 | $1,840,748 | [1] 2,411,809 | [1] $3,337,754 |
| 1952 | 450,444 | 1,544,668 | 1,886,299 | 2,324,583 | 2,336,743 | 3,869,251 |
| 1953 | 367,385 | 1,473,859 | 1,937,817 | 3,099,142 | 2,305,202 | 4,573,001 |
| 1954 | 313,679 | 675,407 | 1,713,413 | 2,807,043 | 2,027,092 | 3,482,450 |
| 1955 | 363,385 | 747,660 | 1,975,194 | 3,231,312 | 2,338,579 | 3,978,972 |
| 1956 | 440,981 | 869,627 | 1,816,894 | 3,135,813 | 2,257,875 | 4,005,440 |

[1] Includes 16,957 tons of fuller's earth valued at $183,656.

**Fluorspar.**—Illinois led the Nation in producing fluorspar, furnishing 54 percent of the total domestic output. Illinois output in 1956 increased 7 percent in quantity and 8 percent in total value over 1955. The increase was attributed partly to the purchases of Metallurgical-grade fluorspar by the General Services Administration for the Government stockpile. Approximately 8 percent of Illinois production was sold to the Government. Consumption of fluorspar in the United States reached an alltime high in 1956. The increased demand was met by rising domestic production and imports. The Government imported Acid-grade fluorspar under contracts bartering surplus agricultural commodities for it. Mexico furnished 65 percent of the total imports (485,600 tons) in 1956. In July the Congress authorized the Government to begin purchasing 250,000 short tons of newly mined domestic Acid-grade fluorspar at a base price of

Digitized by Google

TABLE 5.—Fluorspar shipped from mines, 1947–51 (average) and 1952–56

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Total | Average per ton |
| 1947–51 (average) | 163,910 | $6,499,620 | $39.65 | 1954 | 107,830 | $5,989,219 | $55.54 |
| 1952 | 188,293 | 9,481,223 | 50.35 | 1955 | 166,337 | 7,838,471 | 47.12 |
| 1953 | 163,303 | 8,567,026 | 52.46 | 1956 | 178,254 | 8,469,450 | 47.51 |

$53.00 per short ton, with bonuses and penalties for the silica content. However, the program was not developed in time to affect State fluorspar output for 1956.

Nearly 49 percent of fluorspar shipped from Illinois was used by the aluminum and chemical industries to manufacture hydrofluoric acid. Approximately 15 percent of the output was for steel and foundry use. The glass and enamel industries consumed 13 percent of the total production. The remainder of the output supplied miscellaneous uses, including sales to the Government. Nearly 60 percent of State fluorspar shipments in 1956 were classified as Acid grade and almost 25 percent as Metallurgical; Ceramic grade supplied the remainder. The value of Acid grade in 1956 averaged $54.40 compared with $58.75 in 1955; Metallurgical grade, $33.50 (1956) and $29.10 (1955); and Ceramic grade, $43.28 (1956) and $42.72 (1955).

Leading producers in the State in 1956 were Aluminum Company of America, Mackey-Humm Mining Co., Minerva Oil Co., and Ozark-Mahoning Co. The entire output of finished fluorspar in Illinois in 1956 was credited to Hardin County, although some crude material was mined in Pope County.

One DMEA contract for exploration for fluorspar in Pope County was in effect during the early part of 1956. Work had begun on the contract in July 1955 and was ended in February 1956. The Government share of the actual cost of the project was approximately $7,000.

**Lime.**—Six lime plants were operated in Illinois in 1956 in Adams, Cook, and St. Clair Counties. The total output of quick and hydrated lime decreased slightly in quantity below 1955. The total value, however, was greater in 1956 than in the preceding year, reflecting the rise in operating costs. New labor contracts granting wage increases were signed in 1956. Output was used for building, refractory, chemical, and industrial purposes. Producers were Aluminum Company of America, Marblehead Lime Co., Menke Stone & Lime Co., and Standard Lime & Cement Co.

**Perlite.**—Perlite-processing plants were operated in Champaign, Cook, Lake, and Will Counties in 1956. Sales of expanded perlite totaled 22,400 tons valued at $1,209,000—an increase of 35 percent in quantity and 27 percent in total value over 1955. Crude material processed at the plants was mined in Arizona, Colorado, and New Mexico. The expanded product was employed chiefly as a lightweight aggregate in plaster and concrete, for filter purposes, and other uses.

**Sand and Gravel.**—Illinois ranked third in the Nation in quantity of sand and gravel produced in 1956. The total output was approximately 31.2 million tons valued at over $33 million—an increase of

Digitized by Google

**TABLE 6.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| Class of operation and use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| **COMMERCIAL OPERATIONS** | | | | | | |
| Sand:[1] | | | | | | |
| Glass | 1,155,359 | $2,670,748 | $2.31 | 1,316,721 | $3,175,237 | $2.41 |
| Molding | 853,110 | 1,922,344 | 2.25 | 1,030,859 | 2,583,222 | 2.51 |
| Building | 6,590,497 | 5,360,272 | .81 | 8,224,086 | 6,553,423 | .80 |
| Paving | 1,962,809 | 1,477,777 | .75 | 2,664,363 | 2,080,129 | .78 |
| Grinding and polishing | 135,388 | 338,470 | 2.50 | 154,271 | 401,054 | 2.60 |
| Blast | 228,754 | 1,191,556 | 5.21 | 210,562 | 1,221,375 | 5.80 |
| Fire or furnace | 6,005 | 14,412 | 2.40 | 7,620 | 23,413 | 3.07 |
| Engine | 82,299 | 100,693 | 1.22 | 86,347 | 114,584 | 1.33 |
| Filter | 15,399 | 11,303 | .73 | 24,790 | 22,584 | .91 |
| Railroad ballast | 95,641 | 68,982 | .72 | 63,548 | 43,332 | .68 |
| Ground | 265,984 | 2,441,256 | 9.18 | 264,960 | 2,611,054 | 9.85 |
| Other | 484,835 | 1,148,230 | 2.37 | 496,876 | 1,366,086 | 2.75 |
| Total | 11,876,080 | 16,746,043 | 1.41 | 14,545,003 | 20,195,493 | 1.39 |
| Gravel: | | | | | | |
| Building | 5,766,453 | 4,994,533 | .87 | 7,721,934 | 6,711,023 | .87 |
| Paving | 6,118,534 | 4,765,494 | .78 | 6,249,004 | 4,673,035 | .75 |
| Railroad ballast | 644,432 | 449,069 | .70 | 616,909 | 404,977 | .66 |
| Other | 364,433 | 220,036 | .60 | 513,190 | 531,488 | 1.04 |
| Total | 12,893,852 | 10,429,132 | .81 | 15,101,037 | 12,320,523 | .82 |
| Total sand and gravel | 24,769,932 | 27,175,175 | 1.10 | 29,646,040 | 32,516,016 | 1.10 |
| **GOVERNMENT-AND-CONTRACTOR OPERATIONS** | | | | | | |
| Sand: | | | | | | |
| Building | 950 | 328 | .35 | 1,112 | 278 | .25 |
| Paving | 159,685 | 100,991 | .63 | 161,354 | 57,417 | .36 |
| Total | 160,635 | 101,319 | .63 | 162,466 | 57,695 | .36 |
| Gravel: | | | | | | |
| Building | 63,862 | 19,918 | .31 | 79,455 | 29,015 | .37 |
| Paving | 1,367,931 | 842,561 | .62 | 1,350,622 | 651,653 | .48 |
| Total | 1,431,793 | 862,479 | .60 | 1,430,077 | 680,668 | .48 |
| Total sand and gravel | 1,592,428 | 963,798 | .61 | 1,592,543 | 738,363 | .46 |
| **ALL OPERATIONS** | | | | | | |
| Sand | 12,036,715 | 16,847,362 | 1.40 | 14,707,469 | 20,253,188 | 1.38 |
| Gravel | 14,325,645 | 11,291,611 | .79 | 16,531,114 | 13,001,191 | .79 |
| Grand total | 26,362,360 | 28,138,973 | 1.07 | 31,238,583 | 33,254,379 | 1.06 |

[1] Includes friable sandstone.

18 percent in both quantity and value over 1955. The increase was due chiefly to the rise in building and road construction. Production was reported from 69 counties in the State. Counties from which over 1 million tons were produced in 1956 were Kane, La Salle, McHenry, Peoria, Will, and Winnebago.

Nearly 85 percent of the quantity produced in the State in 1956 was for building and paving uses. Substantial quantities were employed in manufacturing glass, for molding purposes, grinding and polishing, sandblasting, engine use, and railroad ballast.

Approximately 95 percent of the total output was produced at commercial operations and the remaining 5 percent at Government-and-contractor operations. Nearly 61 percent of the shipments to

Digitized by Google

consumers was by truck and 26 percent by rail; water transportation supplied the remaining 13 percent.

Major producers of sand and gravel in Illinois in 1956 were: Chicago Gravel Co., Consumers Co., Material Service Corp., and Wedron Silica Co., all of Chicago; Elmhurst-Chicago Stone Co., Elmhurst; McGrath Sand & Gravel Co., Lincoln; Ottawa Silica Co. and Standard Silica Co., both of Ottawa; Rowe Construction Co., Bloomington; and Wyanet Sand & Gravel, Wyanet.

**Stone.**—The total production of stone in Illinois in 1956 was nearly 32 million tons valued at $41 million—an increase of 10 percent in quantity and 15 percent in value over 1955. The chief reason for the marked rise in output was the increased consumption of crushed limestone for concrete aggregate and roadstone as a result of the great activity in building and road construction in the State. Substantial increases were also recorded in producing crushed limestone for agricultural purposes and railroad ballast. Stone production in the State consisted almost entirely of limestone, however, a small quantity of sandstone was produced in Alexander County for refractory purposes.

Nearly 99 percent of the stone produced in Illinois came from commercial sources; the remainder, from Government-and-contractor operations. Output of crushed and broken limestone was recorded from 58 counties in the State in 1956. Major producing counties

**TABLE 7.—Limestone sold or used by producers in 1955–56, by uses [1]**

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Quantity | Value | | Quantity | Value | |
| | | Total | Average per unit of measure | | Total | Average per unit of measure |
| Dimension: | | | | | | |
| Rubble.....short tons.. | 914 | $4,883 | $5.34 | 2,018 | $9,770 | $4.84 |
| Rough architectural [2] cubic feet.. | 8,371 | 3,532 | .42 | 3,937 | 2,889 | .73 |
| Dressed (cut).....do.... | 2,700 | 6,800 | 2.52 | 2,224 | 5,670 | 2.55 |
| Curbing and flagging...do.... | 18,401 | 12,427 | .68 | 7,180 | 5,351 | .75 |
| Total dimension equivalent short tons [3].. | 3,419 | 27,642 | 8.08 | 3,152 | 23,680 | 7.51 |
| Crushed and broken: | | | | | | |
| Riprap.....short tons.. | 173,098 | 214,306 | 1.24 | 153,007 | 197,810 | 1.29 |
| Flux.....do.... | 298,675 | 531,206 | 1.78 | 280,500 | 496,724 | 1.77 |
| Refractory.....do.... | 18,900 | 24,570 | 1.30 | (4) | (4) | (4) |
| Concrete aggregate and roadstone.....short tons.. | 20,825,065 | 26,711,592 | 1.28 | 23,175,590 | 30,709,970 | 1.33 |
| Railroad ballast.....do.... | 839,866 | 987,725 | 1.18 | 982,979 | 1,258,465 | 1.28 |
| Agriculture.....do.... | 2,600,215 | 3,341,049 | 1.28 | 3,094,594 | 4,014,372 | 1.30 |
| Other uses.....do.... | 4,105,892 | 3,769,218 | .92 | [4] 4,164,415 | [4] 4,150,757 | [4] 1.00 |
| Total crushed and broken short tons.. | 28,861,711 | 35,579,666 | 1.23 | 31,851,085 | 40,828,098 | 1.28 |
| Grand total.....do.... | 28,865,130 | 35,607,308 | 1.23 | 31,854,237 | 40,851,778 | 1.28 |

[1] Includes both commercial and Government-and-contractor production.
[2] Figures for rough construction and rough architectural uses are combined and shown under "Rough architectural" in order to avoid disclosing individual company confidential data.
[3] Average weight of 170 pounds per cubic foot used to convert cubic feet to short tons.
[4] Figures for refractory (1956) are combined with "Other uses" to avoid disclosing individual company confidential data.

Digitized by Google

were Cook, La Salle, St. Clair, and Will. About 73 percent of the total limestone output was used for concrete aggregate and roadstone. Almost 10 percent was used for agricultural purposes. Substantial quantities were used for railroad ballast, riprap, flux, cement and lime, and other purposes. Dimension limestone was produced in Kane, Kankakee, McHenry, Madison, Monroe, St. Clair, and Williamson Counties in 1956.

The principal producers of limestone in the State were: Allied Chemical & Dye Corp., Columbia Quarry Co., Consumers Co., Dolese & Shepard Co., East St. Louis Stone Co., Lehigh Stone Co., Lincoln Stone Co., Marquette Cement Manufacturing Co., Material Service Corp., and Mississippi Lime Co. The only producer of sandstone in Illinois was Western Fire Brick Co.

**Sulfur.**—Elemental sulfur was recovered by the Pure Oil Co. as a byproduct at its Lemont Refinery in Cook County.

**Tripoli.**—Tripoli (amorphous silica) was mined by two companies in northern Alexander County. Production of crude and prepared material was about the same as in 1955. Output was used chiefly for abrasive and filler.

**Vermiculite.**—Total output of exfoliated vermiculite increased slightly over 1955. Plants in Cook, Macoupin, and Will Counties processed vermiculite from material mined in Montana, South Carolina, and South Africa. The exfoliated product was used principally in manufacturing insulating materials, as a lightweight aggregate in plaster and concrete, as a loose insulating filler, and for other purposes.

## METALS

**Lead, Silver, and Zinc.**—Metals produced in Illinois in 1956 and credited to the State were lead, silver, and zinc. Mines in Jo Daviess County (Northern Illinois district) furnished 61 percent of zinc output and 45 percent of lead produced in Illinois in 1956. The remainder of the zinc, over half the lead, and all of the silver were recovered as byproducts or coproducts of fluorspar mining in Hardin County (Southern Illinois district). Zinc output in the State increased 11 percent in quantity over 1955; lead production decreased 16 percent below the preceding year. Continuing Government purchases of zinc for the national stockpile contributed to the rise in output of zinc. Silver was recovered as a byproduct of refining lead to obtain a silver-free lead product.

**TABLE 8.—Mine production of silver, lead, and zinc, 1952–56, in terms of recoverable metals**

| Year | Mines producing | Material sold or treated [1] (short tons) | Silver | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|
| | | | Fine ounces | Value | Short tons | Value | Short tons | Value | |
| 1952 | 21 | 930,526 | 3,781 | $3,422 | 4,262 | $1,372,364 | 18,816 | $6,246,912 | $7,622,698 |
| 1953 | 21 | 700,844 | 2,338 | 2,116 | 3,391 | 888,442 | 14,556 | 3,347,880 | 4,238,438 |
| 1954 | 21 | 603,675 | 1,160 | 1,050 | 3,232 | 885,568 | 14,427 | 3,116,232 | 4,002,850 |
| 1955 | 13 | 839,555 | 3,075 | 2,783 | 4,544 | 1,354,112 | 21,700 | 5,338,200 | 6,695,095 |
| 1956 | 23 | 851,285 | 1,580 | 1,430 | 3,832 | 1,203,248 | 24,039 | 6,586,686 | 7,791,364 |

[1] Data include fluorspar ore from which lead and/or zinc were recovered as follows: 1952—384,203 tons; 1953—353,570 tons; 1954—202,478 tons; 1955—309,311 tons; and 1956—336,635 tons.

Digitized by Google

**TABLE 9.—Mine production of silver, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Northern Illinois | | Southern Illinois | | | Total Illinois | | |
|---|---|---|---|---|---|---|---|---|
| | Lead (short tons) | Zinc (short tons) | Silver (fine ounces) | Lead (short tons) | Zinc (short tons) | Silver (fine ounces) | Lead (short tons) | Zinc (short tons) |
| January | 125 | 1,360 | 240 | 260 | 965 | 240 | 385 | 2,325 |
| February | 150 | 1,125 | 330 | 300 | 950 | 330 | 450 | 2,075 |
| March | 165 | 1,350 | 250 | 325 | 1,050 | 250 | 490 | 2,400 |
| April | 130 | 1,110 | 300 | 225 | 850 | 300 | 355 | 1,960 |
| May | 200 | 1,390 | 190 | 175 | 890 | 190 | 375 | 2,280 |
| June | 185 | 1,300 | 60 | 155 | 725 | 60 | 340 | 2,025 |
| July | 125 | 890 | 150 | 70 | 620 | 150 | 195 | 1,510 |
| August | 175 | 1,145 | 55 | 70 | 650 | 55 | 245 | 1,795 |
| September | 135 | 1,100 | ------- | 165 | 685 | ------- | 300 | 1,785 |
| October | 130 | 1,350 | ------- | 95 | 805 | ------- | 225 | 2,155 |
| November | 100 | 1,265 | 5 | 150 | 680 | 5 | 250 | 1,945 |
| December | 104 | 1,223 | ------- | 118 | 561 | ------- | 222 | 1,784 |
| Total | 1,724 | 14,608 | 1,580 | 2,108 | 9,431 | 1,580 | 3,832 | 24,039 |

The principal producers of metals in Jo Daviess County in 1956 were Eagle-Picher Co. and Tri-State Zinc, Inc.; and in Hardin County, Aluminum Company of America, Ozark-Mahoning Co., and Minerva Oil Co.

Prices used to calculate total values in 1956 were silver $0.9050505 per fine ounce, lead 15.7 cents per pound, and zinc 13.7 cents per pound. In 1955 the silver price was the same; lead was 14.9 cents per pound and zinc 12.3 cents per pound.

**Pig Iron.**—In spite of the 34-day steel strike, which began on July 1, pig-iron production in Illinois increased slightly over 1955. Production of all classes totaled approximately 6.5 million net tons. Annual capacity of blast furnaces in the State at the end of 1956 was 7,467,700 net tons.[3] Of the 10.4 million net tons of iron ore (containing less than 5 percent Mn, natural) consumed in Illinois blast furnaces (excludes ore consumed in sintering plants and steel furnaces), about 99.6 percent came from domestic mines, and the remainder was imported. Quantities of other materials consumed in blast furnaces in the State in 1956 included: Purchased scrap, 256,166 net tons; home scrap, 142,847 net tons; mill cinder and roll scale, 304,688 net tons; open-hearth and bessemer slag, 934,755 net tons; coke, 5,463,493 net tons; limestone, 1,940,642 net tons; and sinter, 1,072,769 net tons. Approximately 678,000 net tons of flue dust was recovered at Illinois blast furnaces n 1956. Most of this material was consumed in making sinter.

**Thorium, Uranium, and Rare-Earth Metals.**—A contract between the Defense Minerals Exploration Administration (DMEA) and William G. Reynolds of Anchorage, Ky., for the exploration for thorium, uranium, and rare earths in Hardin County was in effect during part of 1956. Work was begun on the contract in April 1956 and was ended in August; the Government share of the actual cost of the project amounted to about $3,450.

[3] American Iron and Steel Institute, Annual Statistical Report: 1956.

Digitized by Google

## REVIEW BY COUNTIES

**Adams.**—Quick and hydrated lime for building, chemical, and industrial uses was produced at plants operated by Marblehead Lime Co. near Marblehead and by Menke Stone & Lime Co. near Quincy. Both companies also mined limestone underground in the county. Output was for concrete aggregate and roadstone, agricultural purposes, metallurgical uses, and mineral food. Missouri Gravel Co. and Western Ill. Stone Co. operated portable crushing plants and reported output of crushed limestone for agricultural and road purposes. The Black & White Limestone Co. underground limestone mine produced crushed and broken limestone for riprap, flux, concrete aggregate and roadstone, agricultural purposes, asphalt filler, mineral food, and various other uses.

Quincy Sand Co. dredged near Quincy and produced sand and gravel for building and road construction and other uses. Blick's Construction Co. produced sand for miscellaneous uses.

**Alexander.**—H. H. Halliday Sand Co. operated a dredge on the Ohio River near Cairo and reported output for building and road purposes and engine use. Sand and gravel for road use was produced under contract for the State highway department.

Clay for manufacturing heavy clay products was produced near Thebes from a pit owned by Illinois Minerals Co.

**TABLE 10.—Value of mineral production in Illinois, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adams | $1,212,320 | $1,377,859 | Stone, lime, sand and gravel. |
| Alexander | [3] 214,937 | 247,535 | Tripoli, sand and gravel, stone, clays. |
| Bond | 87,469 | 88,805 | Clays, sand and gravel, stone. |
| Boone | 147,004 | 162,338 | Stone, sand and gravel, clays. |
| Brown | 143,650 | 42,700 | Sand and gravel, clays. |
| Bureau | 3,531,567 | (2) | Coal, sand and gravel, clays. |
| Calhoun | 17,341 | 21,005 | Stone, sand and gravel. |
| Carroll | 180,579 | 118,281 | Sand and gravel, stone. |
| Cass | 500 | 200 | Sand and gravel. |
| Champaign | 170,449 | 161,657 | Do. |
| Christian | 19,358,702 | 19,575,794 | Coal. |
| Clark | 324,062 | 547,107 | Stone, sand and gravel. |
| Clay | 133,500 | 26,912 | Stone. |
| Clinton | 659,642 | 699,277 | Coal, stone, sand and gravel. |
| Coles | 275,905 | (2) | Stone, sand and gravel. |
| Cook | 22,757,216 | 25,867,660 | Stone, lime, clays, sand and gravel, sulfur, peat. |
| Crawford | 97,870 | 96,490 | Sand and gravel. |
| Cumberland | 35,809 | 42,590 | Do. |
| De Kalb | 523,195 | 458,104 | Sand and gravel, stone. |
| De Witt | | (2) | Sand and gravel. |
| Douglas | 1,376,737 | 1,677,170 | Coal. |
| Du Page | 1,507,527 | 1,740,788 | Stone, sand and gravel. |
| Edwards | 53,250 | 55,950 | Clays. |
| Effingham | 85,000 | (2) | Stone. |
| Fayette | 53,847 | 83,679 | Sand and gravel, clays. |
| Ford | 104,901 | 93,716 | Sand and gravel. |
| Franklin | 19,211,041 | 20,208,174 | Coal. |
| Fulton | 20,257,683 | 20,906,957 | Coal, sand and gravel. |
| Gallatin | 571,563 | 721,309 | Do. |
| Greene | 152,252 | 185,423 | Stone, clays, coal. |
| Grundy | 2,356,962 | 2,324,148 | Coal, sand and gravel, clays. |
| Hancock | 440,727 | 297,914 | Coal, stone. |
| Hardin | 11,185,703 | 11,999,726 | Fluorspar, zinc, lead, stone, sand and gravel, silver. |
| Henderson | 147,378 | 183,990 | Stone. |
| Henry | 484,410 | 531,441 | Coal, sand and gravel. |
| Jackson | 4,119,237 | (2) | Coal, stone, sand and gravel. |
| Jefferson | 6,432,152 | 10,831,249 | Coal. |
| Jersey | (2) | 36,391 | Stone, sand and gravel. |
| Jo Daviess | 3,968,921 | 4,685,338 | Zinc, lead, stone, sand and gravel. |

See footnotes at end of table.

Digitized by Google

TABLE 10.—Value of mineral production in Illinois, 1955–56, by counties [1]—Con.

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Johnson | (2) | (2) | Stone, coal. |
| Kane | $1,229,378 | $1,471,452 | Sand and gravel, stone. |
| Kankakee | 4,477,631 | (2) | Coal, stone, clays, sand and gravel. |
| Kendall | (2) | 311,677 | Stone, sand and gravel. |
| Knox | 6,889,732 | (2) | Coal, clays, stone, sand and gravel. |
| Lake | 502,803 | 615,657 | Sand and gravel, clays, peat. |
| La Salle | 31,006,707 | 34,903,809 | Cement, sand and gravel, stone, clays, coal. |
| Lawrence | 113,439 | 82,863 | Sand and gravel. |
| Lee | 5,482,209 | (2) | Cement, stone, sand and gravel, clays. |
| Livingston | 1,561,257 | 1,679,487 | Stone, sand and gravel, clays, coal. |
| Logan | 652,566 | 571,880 | Sand and gravel, stone, coal. |
| Macon | 242,838 | (2) | Sand and gravel. |
| Macoupin | 1,276,141 | 1,285,773 | Coal, stone. |
| Madison | 4,991,689 | 5,495,406 | Coal, stone, sand and gravel, clays. |
| Marion | | 33,653 | Coal. |
| Marshall | (2) | 570,394 | Sand and gravel, clays. |
| Mason | | 697 | Sand and gravel. |
| Massac | 109,852 | 16,472 | Sand and gravel, stone. |
| McDonough | 332,094 | 425,487 | Stone, clays. |
| McHenry | 1,514,744 | 1,906,230 | Sand and gravel, stone. |
| McLean | 622,356 | (2) | Do. |
| Menard | 239,241 | 378,388 | Stone, coal, clays. |
| Mercer | 168,175 | 132,941 | Stone, clays. |
| Monroe | (2) | (2) | Stone, sand and gravel. |
| Montgomery | (2) | (2) | Coal, stone, sand and gravel. |
| Ogle | 1,197,135 | 1,421,841 | Sand and gravel, stone. |
| Peoria | 3,443,575 | 3,620,831 | Coal, sand and gravel, stone. |
| Perry | 13,675,426 | 17,621,732 | Coal. |
| Pike | 240,705 | 302,259 | Sand and gravel, stone. |
| Pope | 7,906 | 4,893 | Sand and gravel. |
| Pulaski | (2) | (2) | Stone, clays. |
| Putnam | | 35,565 | Sand and gravel. |
| Randolph | 4,738,899 | (2) | Coal, stone, sand and gravel. |
| Rock Island | 790,630 | 879,172 | Stone, sand and gravel, clays. |
| St. Clair | 13,929,783 | 17,139,879 | Coal, stone, lime, sand and gravel, clays. |
| Saline | 16,992,039 | 11,347,675 | Coal. |
| Sangamon | 847,441 | 844,491 | Sand and gravel, coal, clays. |
| Schuyler | 151,488 | 155,647 | Coal, sand and gravel, stone. |
| Scott | 194,353 | (2) | Stone, sand and gravel. |
| Shelby | (2) | (2) | Do. |
| Stark | 27,500 | | |
| Stephenson | 144,100 | 197,041 | Stone, sand and gravel. |
| Tazewell | 855,402 | 1,057,640 | Sand and gravel, peat, clays, coal. |
| Union | 376,472 | 354,431 | Stone. |
| Vermilion | 4,404,642 | 5,202,705 | Coal, stone, clays, sand and gravel. |
| Wabash | (2) | 249,134 | Sand and gravel. |
| Warren | | 86,234 | Stone. |
| Washington | 131,692 | 145,356 | Coal, stone. |
| Wayne | 20,430 | | |
| White | 228,640 | (2) | Sand and gravel. |
| Whiteside | 312,427 | 377,759 | Stone, sand and gravel. |
| Will | 5,340,752 | 7,937,900 | Sand and gravel, stone, coal. |
| Williamson | 24,041,155 | 24,862,098 | Coal, stone. |
| Winnebago | 1,830,859 | 1,974,023 | Sand and gravel, stone. |
| Woodford | 81,600 | 120,574 | Sand and gravel. |
| Undistributed | 261,263,104 | 300,402,517 | |
| Total | [3] 533,062,000 | 572,321,000 | |

[1] County figures exclude petroleum, natural gas, natural-gas liquids, and some stone and sand and gravel for which data by counties are not available; these are included with "Undistributed." The following counties are not listed, because no production was reported: Edgar, Hamilton, Iroquois, Jasper, Morgan, Moultrie, Piatt, Richland.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[3] Revised figure.

Sandstone for refractory purposes was produced by Western Fire Brick Co.

Tripoli was produced at underground mines near Elco and Tamms by Ozark Minerals Co. and Tamms Industries, Inc., respectively. Output was used principally for abrasives and filler material.

**Bond.**—Sand and gravel for building use was produced by the Greenville Gravel Co., Inc., at a fixed plant near Greenville. Cyril Munie produced gravel for building and road purposes.

Digitized by Google

Crushed limestone for road use was produced by the Bond Stone Co.

Clay was produced near New Douglas by the Richards Brick Co. for use in manufacturing heavy clay products.

**Boone.**—The Belvidere Lime Quarry, Charles Lee & Sons, and Ewald Winkelman portable crushing plants produced limestone for agricultural and road use.

Sand and gravel for building and road construction was produced by Vincent Spencer Sand & Gravel. Road gravel was produced by Christenson & Smith and under contract for the county highway department.

Munson Bros. & Co. produced clay near Capron for use in manufacturing draintile.

**Brown.**—T. F. Hollembeak & Sons produced sand and gravel for road use. Bridgewater & Gaskill reported output of gravel for miscellaneous purposes.

Clay used in manufacturing heavy clay products was produced near Mount Sterling by Frederic Brick & Tile Co.

**Bureau.**—Midland Electric Coal Corp., at a strip mine near Mineral was the only bituminous-coal producer in Bureau County in 1956. The entire output was cleaned by jigging methods.

Hansen Bros. and Swanson Bros. reported output of road gravel. Floyd Clapp produced gravel near Walnut for building and road use. Western Sand & Gravel Co. produced sand and gravel for building and road construction at a fixed plant near Spring Valley. Wyanet Sand & Gravel produced molding sand and gravel for building use near Wyanet. The county highway department produced gravel for building use and contracted for road gravel. Sand and gravel for road construction was produced under contract for the State highway department.

Clay was produced at Sheffield by the Sheffield Shale Products Co. for use in manufacturing heavy clay products.

**Calhoun.**—Crushed limestone was produced in the county by Calhoun Quarry Co., Paul C. Herter, and Sievers Quarry. Output was for agricultural and road purposes.

West Point Sand Plant produced building and blast sand at a dredge near Batchtown. Road gravel was produced under contract for the State highway department.

**Carroll.**—Nicol Sand Co. produced sand for molding, engine, and paving uses at a fixed plant near Savanna. Howard Nelson produced road gravel. The Oliver Heisler fixed sand and gravel plant near Mount Carroll reported output for building use.

Crushed limestone for agricultural use, concrete aggregate, and roadstone, fertilizer filler, and for manufacturing lime was produced in the county. Producers in 1956 included Allen Boyer, Roscoe Francke, Kingery and Messmer, Minor Bros., and Earl Randecker.

**Cass.**—Paving sand was produced under contract for the State highway department.

**Champaign.**—Sand and gravel for building and road construction was produced near Mahomet by the Mahomet Sand & Gravel Co., Inc., and W. H. Troike & C. R. Plankenhorn. Gibson Bros. and West Champaign Gravel Co. produced road gravel near Champaign. The State highway department contracted for gravel for road purposes. The Ryolex Corp. processed perlite at its plant in Champaign. The

Digitized by Google

expanded product was used chiefly as lightweight aggregate in plaster and concrete.

**Christian.**—Christian County ranked second in the State in coal production. Peabody Coal Co. operated two underground mines—the No. 10 mine near Pawnee and the No. 17 near Pana. The No. 10 mine was the leading producing bituminous-coal mine in the United States in 1956. Most of the county coal output was shipped to consumers by rail.

**Clark.**—Crushed and broken limestone was produced in the county for riprap, agricultural use, and roadstone. Producers during the year were Casey Stone Co., Ralph E. Montgomery, and Quality Lime Co.

Sand and gravel for building and road construction was produced by Barthelemy & Lawrence and Stanfield Gravel Co. The latter company dredged near Darwin.

**Clay.**—Iola Stone & Material Co. crushed limestone near Iola for road use.

**Clinton.**—Coal, limestone, and sand and gravel were produced in the county in 1956. Coal from three underground mines was produced by the Breese Coal Co., Inc., Citizens Coal Co., and the Marion County Coal Mining Corp. (its mine also extended into Marion County).

Buehne Quarry Co. and Huelsmann Quarry crushed limestone for road use.

W. D. Lindsay operated a portable plant near Keyesport and reported output of road gravel. The county highway department produced gravel for building purposes. Road gravel was produced under contract for the State highway department.

**Coles.**—Olen Humphres Stone Quarry produced crushed and broken limestone near Ashmore for riprap, roadstone, agricultural use, and asphalt filler. Charleston Stone Co. and Lang Stone Quarry crushed limestone for road use.

Martin's Sand & Gravel dredged near Ashmore and produced sand and gravel for building use. Verlin Pinnell produced road gravel near Charleston.

**Cook.**—Clays, lime, limestone, peat, sand and gravel, and elemental sulfur were produced in Cook County in 1956. The Material Service Corp.'s four limestone quarries reported output for concrete aggregate and roadstone. Consumers Co. crushed limestone for refractory use, concrete aggregate and roadstone, railroad ballast, asphalt filler, and agricultural purposes. Dolese & Shepard Co. quarried limestone for use as concrete aggregate and roadstone, railroad ballast, flux, and agricultural stone. Stearns Lime & Stone Co. produced crushed limestone chiefly for road use.

Chicago Gravel Co. reported output from a fixed sand and gravel plant near Elgin for building and road construction, railroad ballast, and fill. Paving sand was produced under contract for the State highway department.

The Marblehead Lime Co. lime plants at South Chicago and Thornton produced quick and hydrated lime for building, chemical, and industrial uses. Quicklime for refractory use was produced at La Grange by the Standard Lime & Cement Co.

Digitized by Google

Clays were produced in the county for use in manufacturing building brick and other heavy clay products. Producers included Carey Brick Co., Chicago Brick Co., Illinois Brick Co., and Tuthill Building Materials Co.

The Pure Oil Co. recovered sulfur as a byproduct at its Lemont Refinery.

Peat was produced by Henry Frenzer for use as a soil conditioner.

The American Bildrok Co. and Silbrico Corp. processed perlite in their plants at Chicago. Material processed at the plants was mined in western States. Output was used principally as a lightweight aggregate in plaster and concrete.

The Zonolite Co. exfoliated vermiculite at Chicago from material mined in Montana, South Carolina, and South Africa.

Blast furnaces and coke-oven plants were operated in the vicinity of Chicago. Coke producers in the county included Interlake Iron Corp., International Harvester Co., Peoples Gas Light & Coke Co., Republic Steel Corp., and Youngstown Sheet & Tube Co. Most of the coke produced was consumed in State blast furnaces. In spite of the 5-week steel strike in midsummer, approximately 6 million net tons of pig iron was produced in Cook County—a slight increase over 1955. Pig-iron producers included Interlake Iron Corp., International Harvester Co., Republic Steel Corp., United States Steel Corp., and Youngstown Sheet & Tube Co.

**Crawford.**—Bowman's Gravel Pit produced sand and gravel near Palestine for building and road construction. William J. Wyke produced sand and gravel for building and road use and other purposes. Montgomery Township produced road gravel.

**Cumberland.**—Sand and gravel for building and road construction was produced by the A. B. C. Gravel Co. and Casey Stone Co. The latter company operated a fixed plant near Greenup.

**De Kalb.**—Sand and gravel for building and road construction was produced by Kirkland Gravel Yard, Elmer Larson, Inc., and Donald Tyrrell. The State highway department contracted for sand and gravel for road use.

Crushed limestone was produced by the county highway department for road purposes.

**De Witt.**—The H. M. Rickgauer portable sand and gravel plant near Clinton reported output for road use. Road gravel was produced under contract for the McLean County Highway Department and the State highway department.

**Douglas.**—The Moffat Coal Co. mined coal underground at Murdock. The entire putput was mechanically cleaned by jigging methods.

**Du Page.**—The Elmhurst-Chicago Stone Co. quarried limestone near Elmhurst for use as concrete aggregate and roadstone, railroad ballast, and agricultural purposes. The company also produced sand and gravel near Winfield for building and road construction. Purnell's Gravel Pit produced road gravel.

**Edwards.**—The Albion Brick Co. produced miscellaneous clay at Albion for use in manufacturing heavy clay products.

**Effingham.**—Crushed limestone for agricultural and road use was produced near Altamont by Winters Stone Quarry.

**Fayette.**—Sand and gravel for building and road construction was produced at a fixed plant near Vandalia by Burtschi Sand & Gravel

Digitized by Google

Co. Charles D. Lutz & Sons produced molding sand near Mulberry Grove. The State highway department contracted for road gravel.

The St. Elmo Brick & Tile Co. produced clay near St. Elmo for use in manufacturing heavy clay products.

**Ford.**—W. V. Williams produced gravel, chiefly for road use. Paving sand was produced under contract for the State highway department.

**Franklin.**—Four underground coal mines were operated in the county in 1956: The Old Ben Coal Corp. No. 9, No. 14, and No. 22 mines and the Chicago, Wilmington & Franklin Coal Co. No. 2 mine.

**Fulton.**—Fulton County ranked third in the State in producing bituminous coal in 1956. Output was reported by 17 companies from 13 strip and 6 underground mines. Operators of the underground mines were: Bruketta & Sons Coal Co., Glore & Fritz Coal Co., Maccanelli Coal Co., Pine Bluff Coal Co., Pschirrer Coal Co., and Putt Creek Coal Co., Inc. Strip-mine operators in 1956 included: Big Ten Coal Co., Fairview Collieries Corp., J. & J. Coal Co., Inc., Layne's Coal Co., Lingenfelter Coal Co., Little Sister Coal Corp., Lump Coal Co. (2 mines near Cuba), Peabody Coal Co. (mine formerly operated by Key Coal Co.), Walter Richard Coal Co., Truax-Traer Coal Co., and The United Electric Coal Cos. (No. 9 mine near Cuba and No. 17 mine near Canton).

Sand and gravel for building and road purposes was produced by Liverpool Materials Co. Road gravel was produced under contract for the State highway department.

**Gallatin.**—Bituminous coal was produced by 13 companies from 4 underground mines and 9 strip pits in the county in 1956. Producers during the year were: B. & W. Coal Co., Blu-Blaz-Bloc Coal Co., Inc., M. & L. Coal Co., Pekin Coal Co., Acme Coal & Stone Co., Eagle Valley Coal Co., R. C. Jennings Coal Co., Mathis Bros. Coal Co., New Oak Hill Coal Co., Randall Coal Co., Richardson Coal Corp., Wenzel Construction Co., and Beecher Williams. The Randall Coal Co. strip mine was permanently abandoned in December 1956. Approximately 90 percent of the county coal production was shipped by barge on the Ohio River.

Miller Sand & Gravel Co. produced road gravel. Sand and gravel for building use was produced by the county highway department and for road use under contract for the State highway department.

**Greene.**—Crushed limestone for agricultural and road use was produced in the county. Producers included Orton Quarry, Lyle B. Moushon, and Valstad Quarry.

Clay used for manufacturing fire brick and block was produced near Roodhouse by Lyndall W. Wyatt.

The Birch Creek Coal Co. reported coal production from a strip mine near Roodhouse.

**Grundy.**—Coal was produced near Wilmington by the Northern Illinois Coal Corp. from its strip mine, which also extended into Kankakee County.

Material Service Corp. produced sand and gravel near Morris for buildings and other purposes.

Clay for refractory use was produced near Coal City and Morris by the Illinois Clay Products Co.

Digitized by Google

**Hancock.**—Crushed and broken limestone for riprap, concrete aggregate and roadstone, and agricultural use was produced in Hancock County in 1956. Operators included The Gray Quarries, W. F. Hamma Quarry, Colchester Stone Co., and R. L. O'Neal & Sons.

The sole producer of coal in the county was the Triple S Mines strip mine near Augusta. The entire output was consumed locally.

**Hardin.**—Hardin County continued to be the leading source of fluorspar in the United States, furnishing 54 percent of total domestic output. Principal producers during the year were Aluminum Company of America, Minerva Oil Co., Ozark Mahoning Co., and Mackey-Humm Mining Co. Mining at Aluminum Company of America was conducted from shafts varying from 160 to 800 feet deep. Mining was done in shrinkage stopes. Company ore and custom ore were treated at the company mill near Rosiclare. Concentration processes included dense-medium separation, followed by flotation. Mill products were fluorspar, lead, and zinc concentrates.

Minerva Oil Co. operated several mines and the Minerva No. 1 and Crystal mills near Cave in Rock. The company Jefferson mine was closed in May 1956, and the Rose Creek mine was idle the entire year. At the Minerva No. 1 mine the use of a conveyor belt for long haulage to the shaft was discontinued because of high maintenance and high replacement costs. Diesel-truck roads were improved all the way to the shaft. Pocket improvements were made for the quick turnaround of haulage trucks. The experimental use of polythlene large-diameter tubing for stope ventilation at the Minerva No. 1 mine proved successful. The Minerva Oil Co. rehabilitated the Addison shaft at the Victory mine, and a truck road was developed at this mine, tying together all parts of the underground workings to a hillside adit. The company treated 225,000 short tons of ore at its mills. Most of the material treated was mined by the company; however, approximately 1,500 tons was purchased from other companies. The Minerva No. 1 plant, in addition to Ceramic grades, began producing Acid-grade fluorspar in late 1956. Zinc concentrate produced at the Minerva No. 1 plant was shipped to Josephtown, Pa., by barge on the Ohio River.

Ozark-Mahoning Co. operated its mines near Cave in Rock and the Rosiclare mill during 1956. Company-mined ore and custom ore were treated at the mill, which uses flotation concentration processes, with separate lead, zinc, and fluorspar circuits. Part of the fluorspar concentrate was pelletized.

Mackey-Humm Mining Co. operated its mine and mill near Rosiclare. Mining was conducted from one vertical shaft, about 300 feet deep and was principally open stoping. Custom ores were also treated at the company mill. Although all of its mines were idle in 1956, Rosiclare Lead & Fluorspar Mining Co. reported sales of finished fluorspar. The company sold a quantity of tailing for treatment at other mills. Several other operators produced fluorspar ore, some of which contained lead and/or zinc minerals. Virtually all of this ore was processed at one of the custom mills in the area.

A contract between DMEA and William G. Reynolds, of Anchorage, Ky., covering the exploration for thorium, uranium, and rare earths in Hardin County was in effect during part of 1956. Work was begun on the contract in April 1956 and ended in August.

Digitized by Google

Crushed limestone for agricultural and road purposes was produced near Cave in Rock by Okerson Quarry Co. and Rigsby & Barnard. P. R. Brown Stone Co. quarried limestone near Shellerville for road use. J. L. Bean Stone Co. crushed limestone for road use and railroad ballast.

Road gravel was produced under contract for the Pope County Highway Department.

**Henderson.**—Raid Bros. Construction Co. produced crushed and broken limestone for riprap, road use, and railroad ballast. Galbraith Stone Co. and Olson Bros. quarried limestone for road use. Charles J. Moore operated a portable crushing plant near Dallas City and reported output of limestone for riprap, roadstone, and agricultural purposes. The county highway department crushed limestone for road use.

**Henry.**—Coal production was reported from three underground mines in the county—Bugos-White Coal Co. and Alpha Coal Co. mines near Alpha and the Gem Coal Mine (formerly Jim Mine, Inc.) at Coal Valley.

Collinson Bros. produced road gravel near Kewanee. Oberlaender Sand Co. produced sand near Colona for molding, building, and road uses. Sand and gravel for building and road purposes and railroad ballast was produced near Cleveland by the Schadt Service Co.

**Jackson.**—Coal was produced from three underground mines and four strip pits in Jackson County in 1956. A new strip pit was opened in May 1956 by the C. &. M. Coal Co. Other producers included Elk Coal Co., Johns Coal Co., Ed Blumenstock Coal Co., Mt. Carbon Coal Co., and Truax-Traer Coal Co. (both a strip pit and an underground mine).

Crushed and broken limestone for riprap, roadstone, and agricultural use was produced near Ava by the Illinois Quarry Co.

Paving sand was produced under contract for the State highway department.

**Jefferson.**—The only coal producer in Jefferson County was the Freeman Coal Mining Corp. at the Orient No. 3 underground mine near Waltonville. The mine ranked fifth in the United States in bituminous-coal production in 1956. The entire output (over 2.5 million tons) was mechanically cleaned.

**Jersey.**—Crushed and broken limestone was produced in the county for riprap, road use, and agricultural purposes. Producers included Grafton Quarry, Jersey Quarry Co., and Magnesium Lime Co.

The county highway department produced road gravel.

**Jo Daviess.**—Lead, zinc, limestone, and sand and gravel were produced in the county in 1956. Producers of zinc and/or lead were Eagle-Picher Co., Tri-State Zinc, Inc., and Hickory Hill Mining Co. Eagle-Picher Co. operated the Graham, Snyder, Spillane, and Feehan properties (considered as one operation) throughout the year. Open-stope mining methods were employed; zinc ore was hoisted from a 270-foot shaft. Ore was treated at the company Graham mill, utilizing jigs and flotation processes of concentration. Zinc ore, mined by Eagle-Picher Co. at one of its Wisconsin mines, and zinc-lead custom ore were also treated at the Graham mill. Tri-State Zinc, Inc., mined zinc-lead ore from the Amelia and Gray

Digitized by Google

mines. The Gray mine, consisting of a group of properties, was operated throughout the entire year. Mining methods employed were open stoping and modified shrinkage stoping. Ore was hauled directly to the Gray mill by diesel trucks through an inclined adit approximately 1700 feet in length. At the mill about a half mile from the portal of the adit the ore was concentrated by jigging and flotation.

The Amelia mine, near the Gray mine, was newly operated beginning the middle of May 1956. The company closed down entirely for vacation, July 1–15. Ore was mined by open stoping and hauled by truck to the Gray mill for processing. Hickory Hill Mining Co. mined and shipped nearly pure galena from a near-surface deposit. This company also produced some zinc-lead ore from an adjacent ore deposit. Material was treated at the Graham mill of Eagle-Picher Co.

Crushed limestone for agricultural and road purposes was produced in the county. Quarry operators included: W. E. Broege, Virgil Hardacre, Kingery & Messmer, Rees Construction Co., G. A. Watson, Westaby Construction Co., and E. Wienen & Sons.

The Dubuque Sand & Gravel Co. fixed sand and gravel plant near East Dubuque produced material for building use.

**Johnson.**—The Charles Stone Co. crushed limestone near Cypress for agricultural use, roadstone, and railroad ballast. Southern Illinois Stone Co., Inc., crushed limestone for agriculture, roadstone, asphalt filler, and other uses.

R. C. Jennings & Sons Coal Co. produced bituminous coal from a strip mine near New Burnside. The entire output was shipped to consumers by rail.

**Kane.**—Sand and gravel for building and road construction, railroad ballast, and other uses was produced in Kane County in 1956. Commercial operators during the year were: Fox Valley Gravel Co., Krahn Gravel Co., Material Service Corp., Raymond Sand & Gravel, Edward R. Schneider, and Warren Sellen. Road gravel was produced by the city of Aurora. The State and county highway departments contracted for sand and gravel for road use.

The Fox River Stone Co. produced dimension limestone for rough construction, rubble, and flagging and crushed limestone for flux, roadstone, fertilizer, and asphalt filler.

**Kankakee.**—Clays, coal, limestone, and sand and gravel were produced in the county in 1956. Northern Illinois Coal Corp. produced coal from a strip mine, which extended into Grundy County. The Kankakee County part yielded 74 percent of the total production of the mine in 1956. Output was nearly 13 percent greater than in 1955.

Dimension limestone for rubble, stone veneer, and flagging was produced near Bourbonnais by the Bourbonnais Stone Quarry. Lehigh Stone Co. reported the output of crushed limestone for roadstone, railroad ballast, and agricultural purposes. Manteno Limestone Co. quarried limestone near Manteno for agricultural and road uses.

Miscellaneous clay was produced by the Eastern Illinois Clay Co. and St. Anne Brick & Title Co. near St. Anne and by Kankakee Clay

Digitized by Google

Products Co. near Kankakee. Output was used for manufacturing building brick and other heavy clay products.

Portage-Manley Sand Co. produced sand near Essex for molding use. Paving sand was produced under contract for the State highway department.

**Kendall.**—Central Limestone Co. produced crushed limestone for flux, roadstone, and agricultural use. O. Gunnerson quarried limestone near Lisbon for use as roadstone. Elmer Larson, Inc., produced sand and gravel near Plano for building and road construction. Sand and gravel for road use was produced under contract for the State and county highway departments.

**Knox.**—Bituminous coal was produced from 4 strip mines operated by Midland Collieries, Inc., Stonefort Corp., and Midland Electric Coal Corp. The last company operated 2 mines in 1956—the Middle Grove No. 2 and Rapatee No. 3. The No. 5 mine of Midland Collieries, Inc., was opened in December 1956. Over 99 percent of the county coal output was mechanically cleaned.

The Purington Brick Co. produced clay near Galesburg for use in manufacturing heavy clay products. Crushed limestone for agricultural and road purposes was produced by the Abingdon Rock Co., Inc. The L. K. Bandy Construction Co. portable sand and gravel plant near London Mills reported output for road use and fill.

**Lake.**—Sand and gravel for building and road construction and other purposes was produced during the year. Commercial operators in 1956 were: Carl L. Barthel, Big Hollow Sand & Gravel Co., Inc., Consumers Co., and the Elgin, Joliet & Eastern Railway Co. Paving sand was produced by the county highway department.

The National Brick Co. produced clay near Deerfield for use in manufacturing heavy clay products.

Peat was produced by the Millburn Peat Co. near Lake Villa for use as a soil conditioner.

Coke for foundry use was produced at the Waukegan Plant of Chevrolet & Saginaw Grey Iron Foundry, Division of General Motors Corp.

The Lake Zurich Concrete Products Co. processed perlite at a plant at Lake Zurich. Material processed was mined in Arizona and Colorado. Output was used as lightweight aggregate in plaster and concrete and for filter purposes.

**La Salle.**—Mineral products of La Salle County in 1956 included portland and masonry cements, clays, coal, limestone, and sand and gravel. Portland and masonry cements were produced by Alpha Portland Cement Co., Lehigh Portland Cement Co., and Marquette Cement Mfg. Co. The three companies quarried their own limestone used in manufacturing cement. Other producers of limestone in the county were Sheridan Stone Co., Troy Grove Stone Co., and Utica Stone Co. Output was used for agricultural and road purposes.

Clay used in manufacturing building brick and other heavy clay products was produced by Conco-Meier Co., Arthur Mart, and the Streator Drain Tile Co. Output of clay for Alpha Portland Cement Co. and Marquette Cement Mfg. Co. was used entirely in cement manufacture. LaClede-Christy Co. and Matthiessen & Hegeler Zinc Co. produced clay for refractory purposes. LaClede-Christy Co. also produced coal for its own use in conjunction with its clay pit

465877—58——27

Digitized by Google

near Ottawa. The Dubach Coal Co. strip mine in Lake County produced coal for local consumption.

Sand and gravel produced in the county was used for a variety of purposes, including building and road construction, railroad ballast, and special uses, such as glass manufacture, molding, grinding and polishing, sandblasting, engine use, filter purposes, fire or furnace sand, as filler, for pottery and other uses. Commercial sand and gravel operators in the county included: The American Silica Sand Co., Inc. (operating several pits in the county), E. C. Bellrose Sand Co., General Silica Corp, Illinois Silica Sand Co., Ray LaBolle, La Salle County Portable, Inc., La Salle Silica Co., Edward O. Olson, Ottawa Silica Co., G. H. Pendergast & Co., River Industries, Inc., Spicer Gravel Co., Standard Silica Co., Wedron Silica Co., and Western Sand & Gravel Co. Road gravel was produced under contract for the State and county highway departments.

**Lawrence.**—Gregory Gravel Co. dredged near Lawrenceville and produced sand and gravel for building use and road gravel. The Vincennes Gravel Co., Inc., fixed sand and gravel plant near Lawrenceville reported output for building and road purposes. The State highway department contracted for sand and gravel for road use.

**Lee.**—The Medusa Portland Cement Co. produced portland and masonry cements at its plant near Dixon. The company also produced clay and limestone in the county for use as raw material in cement manufacture. Crushed limestone for agricultural and road purposes was produced by Wilmer Gerdes Quarry, Ward McGinnis, and Stoneridge Limestone Co. Oregon Stone Quarries produced crushed limestone near Dixon for use as roadstone and railroad ballast. Frank N. Butler Co. and Butler Sand & Gravel Co. quarried limestone for agricultural use. The latter company's fixed sand and gravel plant near Nelson reported output for building and road construction. Rock River Ready Mix produced sand and gravel near Dixon for building and road construction and other purposes. C. C. Macklin produced gravel near Steward for building and road uses. Sand and gravel for road purposes was produced under contract for the State highway department.

**Livingston.**—Crushed limestone for agricultural and road purposes was produced by Chenoa Stone Co., Pontiac Stone Co., and Wagner Stone Co. The Livingston Stone Co. quarried limestone near Pontiac for agricultural use, roadstone, asphalt filler, and rock dust for coal mines. Crushed limestone for asphalt filler, agricultural use, and roadstone was produced by the Ocoya Stone Co.

Estep Gravel Co. produced gravel for miscellaneous uses. Road gravel was produced by Valley View Dirt & Gravel Co.under contract for the State highway department.

Clay was produced by Diller Tile Co., Inc., near Chatsworth for use in manufacturing heavy clay products.

The one producer of coal in the county was Baiett & Talbot Coal Co., at a strip mine near Streator. The entire output was consumed locally.

**Logan.**—The Lincoln Sand & Gravel Co. dredged sand and gravel near Lincoln for building and road purposes and sand for engine and filter use. The Rocky Ford Limestone Co. crushed limestone near Lincoln for agricultural use and roadstone. Coal was produced from an underground mine between January and September 7 by the Deer

Digitized by Google

Creek mine and during the rest of the year by Lincoln Coal Mining Co. Part of the output was crushed and treated with oil.

**Macon.**—Decatur Sand & Gravel Co. dredged sand and gravel for building and road construction, fill, and other purposes. Road gravel was produced near Mount Zion by Kirk's Gravel Pit. The State highway department contracted for sand and gravel for road use.

**Macoupin.**—Coal output was reported from three underground mines in the county by the following companies: Little Dog Coal Co., Mt. Olive & Staunton Coal Co., and Virden Mining Corp. The Mt. Olive & Staunton No. 2 mine extended into Madison County; the Macoupin County part furnished about 20 percent of total output from the mine. John Bowers crushed limestone near Mount Olive for road use.

International Vermiculite Co. exfoliated vermiculite at Girard from material mined in Montana. Output was used in high-temperature block, pipe covering, and insulating cements and as industrial loose fill.

**Madison.**—The four following underground coal mines were operated in the county in 1956: Lumaghi Coal Co. and Glen Carbon Mines, Inc., near Collinsville; the Livingston-Mt. Olive Coal Co. No. 1 mine near Livingston; and Mt. Olive & Staunton Coal Co. No. 2 mine near Staunton. Part of the last mine was in Macoupin County.

C. M. Lohr, Inc., near Godfrey and Mississippi Lime Co. near Alton crushed limestone for agricultural and road purposes. Reliance Whiting Co. produced dimension, crushed, and broken limestone near Alton for rough construction, flagging, riprap, roadstone, agricultural use, putty filler, rubber filler, pottery, rock dust for coal mines, asphalt filler, and other uses.

Mississippi Lime Co. produced sand for paving, engine use, and other purposes. Alton Sand Co. produced sand for building use. Gary Dredging Co. reported output of sand for building and paving uses. Paving sand was produced near Granite City by Thompson Asphalt Co. and also under contract for the State highway department.

Alton Brick Co. produced clay near Alton for use in manufacturing heavy clay products and for lightweight aggregate.

Granite City Steel Co. operated coke ovens, blast furnaces, and open-hearth steel furnaces at Granite City.

**Marion.**—The only producer of coal in the county, the Marion County Coal Mining Corp., operated the Glenridge underground mine near Centralia. The mine also extended into Clinton County. In 1956 the Marion County part furnished about 17 percent of the total output of the mine. Some crushing and oil-treating of the coal were performed.

**Marshall.**—Consumers Co. produced sand and gravel for building and road use at its fixed plant at Lacon. Road gravel was produced near La Rose, Toluca, and Henry by Vernon Henry and under contract for the State highway department. Miscellaneous clay for use in manufacturing heavy clay products was produced near Sparland by the Hydraulic-Press Brick Co.

**Mason.**—The State highway department contracted for road gravel.

**Massac.**—Road gravel was produced under contract for the Pope County and State Highway Departments. Crushed limestone for

Digitized by Google

agricultural and road purposes was produced near Mermet by the Columbia Quarry Co.

**McDonough.**—Crushed and broken limestone for riprap, agricultural use, and roadstone was produced in the county by Colchester Stone Co., John McClure Quarry, and Olson Bros. Frank Nelson and J. R. Purtscher produced clay near Colchester for use in manufacturing heavy clay products. Clay used in manufacturing pottery and stoneware was produced near Colchester by Baird Clay mine and Western Stoneware Co.

**McHenry.**—Sand and gravel for building and road construction, railroad ballast, and other purposes was produced in McHenry County in 1956. Commercial operators included: The Chicago & Northwestern Railway Co., Consumers Co., Crystal Lake Trucking & Excavating Co., Garden Prairie Stone Co., Inc., Floyd M. Greibel, McHenry Sand & Gravel Co., Inc., Wayne Nolan, and Tonyan Bros. Sand and gravel was produced under contract for the State highway department. The Garden Prairie Stone Co., Inc., also produced dimension and crushed limestone near Marengo for flagging, roadstone, and agricultural purposes.

**McLean.**—Road gravel was produced by John Howes, McDowell & Heidelberg, Rowe Construction Co., and the county highway department. McGrath Sand & Gravel Co. produced sand and gravel near Bloomington for building and road construction and fill. Crushed limestone for road use was produced near Hayworth by Van Horn.

**Menard.**—Athens Stone Quarry and Indian Point Limestone Products crushed limestone for agricultural and road use.

Coal was produced in the county from underground mines operated by Indian Creek Coal Co., Wilcox-Verna Coal Co. near Petersburg, and Lloyd Coal Co. near Tallula. The entire output was consumed locally.

Clay for manufacturing heavy clay products was produced near Springfield by Springfield Clay Products Co.

**Mercer.**—Independent Materials Co. produced crushed limestone near Viola for roads and other uses. The Hydraulic-Press Brick Co. produced clay near Aledo for use in manufacturing heavy clay products.

**Monroe.**—Columbia Quarry Co. produced crushed and broken limestone near Valmeyer for riprap, metallurgical uses, roadstone, rock dust for coal mines, mixed feeds, and agricultural purposes. Dimension, crushed and broken limestone were produced near Maeystown by the Maeystown Quarry Co. for rubble, riprap, roadstone, agricultural use, and filter purposes. Paving sand was produced under contract for the State highway department.

**Montgomery.**—Freeman Coal Mining Corp., at an underground mine near Farmersville, was the only producer of coal in the county. The entire output was mechanically cleaned.

Litchfield Stone Co. crushed limestone for agricultural and road use, and Nokomis Quarry, for road purposes.

Road gravel was produced under contract for the State highway department.

**Ogle.**—Crushed limestone for road use was produced by Kutz Bros., Earl McKnight, Ogle Construction Co., Rockford Blacktop Construction Co., William Seitz, and the Tri-County Stone Co. Output of

Digitized by Google

crushed and broken limestone for riprap, roadstone, and agricultural purposes was reported by Clarence Lenstrom. Oregon Stone Quarries crushed limestone near Oregon for road use and railroad ballast. Macklin Bros. and N. & L. Construction quarried limestone near Rochelle and Polo, respectively, for agricultural and road purposes. Crushed limestone and gravel for road use were produced under contract for the county highway department.

Sand and gravel was produced in Ogle County for building and road construction, engine use, molding purposes, filler, pottery, and other uses. Producers in 1956 included: Byron Sand & Stone Co., Kutz Bros. Co., McGrath Sand & Gravel Co., The National Silica Co., Howard Nelson, Rockford Blacktop Construction Co., Shilling's Gravel Pit, Valley Ready Mix, Inc., Floyd Weigle, and the Leaf River Township Highway Department.

**Peoria.**—Coal output was reported from 12 mines in Peoria County in 1956. Big Bear Coal Co., Charter Oak Coal Co., Collins Bros. Coal Co., Lee Coal Mining Co., Lightbody Coal Co., Superior Mining Co. (ceased mining in March 1956), and Zaborac Coal Co. mined underground. Strip mines were operated by Howard Albrecht Coal Co., J. & J. Coal Co., Inc., Morgan Coal Co., Pioneer Collieries Co., and Howard Scott Coal Co. About 75 percent of county production was consumed locally; the remaining 25 percent was shipped to markets by barge.

Crushed limestone for agricultural and road use was produced by Chipman Stone Quarry Co., Lamar Stone Co., Long Rock Co., and Trivoli Stone Co. Princeville Stone Co. crushed limestone for road use and railroad ballast.

Sand and gravel was produced in the county for building and road purposes, railroad ballast, and other uses. Producers during the year included: Chillicothe Gravel Co., Construction Materials Co., Coogan Gravel Co., McGrath Sand & Gravel Co., Stevers, Inc., and C. L. Swords & Son. Road gravel was produced under contract for the State and the Stark County Highway Departments.

**Perry.**—Coal was produced from 8 mines—3 underground and 5 strip—in the county in 1956. Operating companies were: Big Five Coal Co., Cutler Coal Co., Inc., Southwestern Illinois Coal Corp., Truax-Traer Coal Co. (2 strip mines near Pinckneyville), Union Colliery Co., The United Electric Coal Cos., and White Bros. Coal Co. (opened a new strip mine near Creal Springs in November 1956). Nearly 97 percent of the county output was shipped to consumers by rail. The Streamline strip mine, operated by Southwestern Illinois Coal Corp., extended into Randolph County; however, about 95 percent of the mine output was credited to Perry County.

**Pike.**—O. A. Booth & Sons and Victor Callender produced road gravel near Nebo and Pittsfield, respectively. Missouri Gravel Co. operated two fixed sand and gravel plants in the county and reported output for building and road purposes and railroad ballast.

Crushed limestone for agricultural and road uses was produced near Pearl. Quarry operators were Lacey & Bauer and the Pearl Stone Co.

**Pope.**—Road gravel was produced under contract for the State and county highway departments.

Fluorspar was mined in Pope County but processed at mills in Hardin County, Ill., and in Kentucky. Operators were Egyptian

Digitized by Google

Mining Co., Hicks Creek Mining Co., and P. M. T. Mining Co.

A contract between DMEA and Ozark Mahoning Co. for the exploration of fluorspar, lead, and zinc was in effect during early 1956. Work had begun on the contract in July 1955 and was ended in February 1956.

**Pulaski.**—Columbia Quarry Co. produced crushed and broken limestone near Ullin for riprap, roadstone, railroad ballast, and agricultural use. The American Charcoal Co. produced clay near Olmstead. Output was used for oil- and grease-absorbent purposes.

**Putnam.**—Road gravel was produced under contract for the State highway department.

**Randolph.**—Coal was produced from five mines in the county in 1956. Operators of underground mines were: Midwest Utilities Coal Corp., Moffat Coal Co., and Western Coal Co. The No. 2 mine of the Moffat Coal Co. was permanently abandoned in February 1956. Strip mines were operated by Ritter Coal Co. and Southwestern Illinois Coal Corp. (its Streamline mine is partly in Perry County).

Crushed limestone for agricultural and road purposes was produced by the Illinois State Penitentiary, Chester Quarry Co., and Al Stotz Quarry. The latter two producers operated underground mines near Chester and Prairie du Rocher, chiefly for chemical purposes.

Southern Illinois Sand Co. operated a dredge near Chester and reported output of sand for building, engine, filter, and road purposes.

**Rock Island.**—Blackhawk Aggregates, Inc., and Builders Sand & Gravel Co. produced sand and gravel near Milan and Albany, respectively, for building use. Moline Consumers Co. dredged sand and gravel for building and road purposes.

Collinson Stone Co. near Milan and Cordova Quarry, Inc., near Cordova crushed limestone for agricultural use, roadstone, and railroad ballast. Midway Stone Co., Inc., produced crushed and broken limestone near Hillsdale for riprap, roadstone, filter use, and agricultural purposes.

Clay used in manufacturing flue liners was produced near Carbon Cliff by the Van-Packer Co., Division of Flint-Kote Co., which acquired Blackhawk Clay Products Co. in August 1956.

**St. Clair.**—Clay, coal, lime, limestone, and sand and gravel were produced. Approximately 3.9 million tons of coal was obtained from 16 underground mines and 3 strip pits. Underground mines included: Belle Valley Coal Co., East Side Coal Co., Mid-Continent Coal Corp., Perry Coal Co., Schubert Coal Co., and Shiloh Valley Coal Co. The Schubert Coal Co. mine was permanently abandoned in May 1956. Strip-mine operators were Midwest Radiant Corp., Morgan Coal Co., and Seminole Coal Corp.

Limestone for rubble, rough architectural use, flagging, riprap, roadstone, railroad ballast, and agricultural purposes was produced in the county. Quarry operators were: East St. Louis Stone Co., Hecker Quarry, Inc., Columbia Quarry Co., and Casper Stolle Quarry.

Missouri-Illinois Material Co. dredged sand near East St. Louis and reported output for building, paving, sand blasting, engine use, and other purposes.

Quick and hydrated lime were produced by the Aluminum Company of America at its East St. Louis plant for building, chemical, and other industrial uses.

Digitized by Google

The Hill Brick Co. produced clay near Belleville for use in manufacturing heavy clay products. Hydraulic-Press Brick Co. produced clay at French Village for use as lightweight aggregate.

**Saline.**—Saline County was one of the major coal-producing counties in the State in 1956. Over 3 million tons of coal was produced by 9 companies from 4 underground mines and 9 strip pits. Companies mining underground during the year included Peabody Coal Co. (No. 43 mine), and the Sahara Coal Co., Inc. (No. 5, No. 7, which was reopened in the latter part of 1956 after a period of inactivity, and No. 16 mines). Strip mines were operated by Robert Franklin Nutty Coal Co., Houston Coal Co., New Oak Hill Coal Co., Richardson Coal Corp., Sahara Coal Co., Inc., Vinyard Coal Co., Beecher Williams Coal Co., and the Saxton Coal Corp., which operated 2 mines, 1 of which was abandoned in August 1956 and the other, a new mine, was opened in September 1956.

**Sangamon.**—Coal for local consumption was produced from two underground mines operated near Cantrall by the Cantrall Coal Co. and Eddy Coal Co.

Sand and gravel for building and road construction and other uses was produced in the county. Commercial producers included Buckhart Sand & Gravel Co., Clear Lake Sand & Gravel Co., and Springfield Sand & Gravel Co. Paving sand was produced under contract for the State highway department.

Poston Brick & Concrete Products Co. produced clay near Springfield for use in manufacturing heavy clay products and for lightweight aggregate. Springfield Clay Products Co. also mined clay near Springfield for use in manufacturing heavy clay products.

**Schuyler.**—Coal was produced from 2 underground mines and 2 strip pits during the year. The entire county output was consumed locally. D. & D. Coal Co. and Wheelhouse Coal Co. mined underground. Eddington Coal Co. and Green Coal Co. strip-mined.

Road gravel was produced by Lyle B. Moushon and under contract for the State highway department.

Vern Mitchell Quarry Co. crushed limestone near Browning for agricultural and road purposes. Western Ill. Stone Co. quarried limestone near Brooklyn for road use.

**Scott.**—Thomas Quarry crushed limestone for agricultural and road uses. Krueger Quarry produced limestone for agricultural purposes near Winchester. Homer E. Grady produced sand for railroad ballast near Exeter.

**Shelby.**—Crushed limestone for road use was produced under contract for the county highway department. Sand and gravel for building and road purposes was produced by Hanfland Sand & Gravel Co. The county highway department produced road gravel.

**Stephenson.**—Limestone was produced in the county for concrete aggregate and roadstone, riprap, fertilizer, and agricultural purposes. Producers in 1956 included: Ray Askey, W. E. Broege, Russell E. Cox, Ed. Finkbeiner & Sons, Fortner Limestone Co., Kutz Bros., Rees Construction Co., Rockford Blacktop Construction Co., Scofield & Co., V. H. Stich, Arthur Zimmerman, and the county highway department.

Road gravel was produced by Rein & Dahl, Inc., Scofield & Co., and under contract for the Loran Township Highway Department.

Digitized by Google

**Tazewell.**—Sand and gravel for building and road construction, engine use, railroad ballast, and filter purposes was produced in the county in 1956. Commercial operators were: Hoffer Construction Co., Inc., McGrath Sand & Gravel Co., C. A. Powley, and Spring Lake Sand & Gravel. Sand and gravel for road use was produced under contract for the State highway department.

Clay used in manufacturing heavy clay products was produced near East Peoria by the Peoria Brick & Tile Co.

Manito Filler Co. produced peat from a bog near Manito for use as a seed inoculant.

Lakeside Coal Co. produced coal from an underground mine near Pekin. The company ceased operations in October 1956.

**Union.**—Anna Quarries, Inc., operated a limestone quarry near Anna and reported output for riprap, concrete aggregate and roadstone, asphalt filler, and agricultural purposes. Crushed limestone for agricultural use was also produced near Anna by the Jonesboro Stone Co.

**Vermilion.**—Production of coal in the county in 1956 increased slightly over the previous year. Underground mines were operated by the B–10 Coal Co., Blue Lake Coal Co., Deep Valley Coal Co., and V-Day Coal Co. Fairview Collieries Corp. and The United Electric Coal Cos. operated strip mines. All coal mining was conducted in the vicinity of Danville and Catlin in the east-central part of the county.

Material Service Corp. crushed limestone near Fairmont for road use.

Sand and gravel producers in 1956 included Blakeney Gravel Co., Lewis & Co., Jesse Speranza, and Elton Wagner Co. Output was for building and road construction, fill, and other uses. Road gravel was produced under contract for the State highway department.

Western Brick Co. produced clay near Danville for use in manufacturing heavy clay products and for lightweight aggregate.

**Wabash.**—Mt. Carmel Sand & Gravel Co. near Mount Carmel produced sand and gravel for building and road construction, railroad ballast, and other purposes. Allendale Gravel Co. produced sand and gravel near Allendale for building and road use. Dunbar Sand & Gravel Co. produced sand and gravel for road use. The State highway department contracted for road gravel.

**Warren.**—Monmouth Stone Co. produced crushed and broken limestone near Monmouth for riprap, roadstone, and agricultural purposes.

**Washington.**—Bois Coal Co. near DuBois and Venedy Coal Co., near Venedy, produced coal from underground mines.

Radom Quarry produced crushed limestone near Radom for agricultural and road purposes. Limestone for road use was also produced by Pitts Quarry and under contract for the county highway department.

**White.**—Eastwood Sand & Gravel and Frashier Bros. dredged sand and gravel for building and road purposes. Road gravel was produced by Miller Sand & Gravel Co. and under contract for the State highway department.

**Whiteside.**—Cordova Quarry, Inc., crushed limestone near Erie for agricultural use, roadstone, and railroad ballast. Alldritt Bros.

Digitized by Google

quarried limestone near Morrison for road use and fertilizer filler. Fred R. McKenzie & Co. reported output of crushed and broken limestone for riprap, roadstone, and agricultural pruposes. Crushed limestone for road use was produced by Johnson Coal Co., Butler Sand & Gravel, and Rein & Dahl, Inc., and under contract for the county highway department.

Anderson Ready Mix produced sand and gravel for building use and other purposes. Ernest Johnson produced gravel near Lyndon for miscellaneous uses. William L. Taber reported output for building use from gravel pit near Prophetstown. Road gravel was produced by Midwest Sand & Gravel Co. and Jordan Township.

**Will.**—The Chicago Gravel Co. operated fixed sand and gravel plants near Plainfield and Joliet, producing material for building and road construction, railroad ballast, and fill. Elmhurst-Chicago Stone Co. produced sand and gravel near Lisle for building and road purposes. Road gravel was produced by C. N. Monk. The State highway department contracted for sand and gravel for road use. Material Service Corp. produced sand and gravel for building use and other purposes. The company also quarried limestone near Lockport for use as concrete aggregate and roadstone. The Lincoln Stone Co. produced crushed limestone near Joliet for agricultural use, roadstone, railroad ballast, and flux. National Stone Co. quarried limestone near Joliet for agricultural use, roadstone, railroad ballast, and other purposes. The Illinois State Penitentiary produced crushed limestone for agricultural and road use.

Bituminous coal was produced by Wilmington Coal Mining Corp. from a strip mine near Braidwood.

United States Steel Corp. produced coke at its Joliet Works for use in blast furnaces.

F. E. Schundler & Co., Inc., exfoliated vermiculite and expanded perlite at Joliet from a material mined in Western States. Output was used chiefly as lightweight aggregate in plaster and concrete and for insulation purposes.

**Williamson.**—Williamson County led in coal production in the State. A total of 37 mines (20 underground and 17 strip) was operated by the following companies: Barbara Kay Coal Co, Bell & Zoller Coal Co., Big 3 Coal Co., Black Crystal Coal Co., Blue Bell Coal Co., Blue Bird Coal Co., Blue Blaze Coal Co. of Carterville, C. & C. Coal Co., Carmac Coal Co., Bert Chamness Construction Co., Cherry Hill Coal Co., Farley Bros. (Black Dot Coal Co.), Forsyth Carterville Coal Co., Freeman Coal Mining Corp., Harrisburg Coal Co., R. C. Jennings & Son Coal Co., McHorn Coal Co., McLaren Coal Co., Moore & Son Coal Co., New Black Diamond Coal Co., New Walnut Valley Coal Co., P. & R. Coal Co., Parton Coal Co., Peabody Coal Co., Stilley Coal Co., Stonefort Corp., Strobel Coal Co., Tregoning Coal Co., Wenzel Construction Co., Wilco Coal Co., Wilkins Coal Co., Wilkins Construction Co., and Wyvan Coal Co. The Morgan-Herrin mine, formerly owned by Morgan Mines, Inc., was purchased by Peabody Coal Co. during the year and renamed "Energy". Carmac Coal Co. acquired the Delta mine from Delta Collieries in March 1956. P. & R. Coal Co. opened up a new strip mine near Benton in November 1956. Over 95 percent of the county coal output was shipped to markets by rail; the remainder was consumed locally.

Digitized by Google

The county highway department produced dimension limestone for use as rubble and crushed limestone for road purposes.

**Winnebago.**—Sand and gravel output in the county in 1956 was employed for building and road construction, engine use, railroad ballast, and fill. Producers during the year included: Anderson Sand & Gravel Co., Consumers Co., Illinois-Wisconsin Sand & Gravel Co., Kelley Sand & Gravel Co., Larson Bros. Sand & Gravel, Northwest Gravel Co., Sahlstrom & Sons, and South Beloit Sand Co.

Crushed limestone for agricultural and road purposes was produced by Charles Lee & Sons, William Nordhop, and Porter Bros. Output of limestone for road use was reported by Charles Ind Co., operating the Byrne and Mulford Quarries by Rockford Blacktop Construction Co., and by Pecatonica Township.

**Woodford.**—Road gravel was produced near Secor by the Wood-Mar Construction Co. and under contract for the McLean County Highway Department.

Digitized by Google

# The Mineral Industry of Indiana

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey, Indiana Department of Conservation.

By Donald F. Klyce [1] and John B. Patton [2]

FURTHER inflation was reflected in Indiana's 1956 minerals production, as its value increased nearly 7 percent to $196 million; its volume held close to the 1955 quantities. Output value of 5 mineral commodities furnished over 90 percent of the State total. Coal production increased in tonnage and value 6 and 10 percent, respectively. Cement production was about the same as in 1955, but its value rose 13 percent. Petroleum volume and value were each 5 percent more than in 1955. Sand and gravel tonnage declined 2 percent; its value was slightly higher than in 1955. Dimension-limestone tonnage decreased 18 percent, and value dropped 23 percent; crushed limestone increased about 5 percent over 1955.

Higher coal production was due to increased power requirements in the Ohio Valley—the continuation of a trend that began in 1955 with the development of atomic-energy facilities in that area.

Decrease in building, combined with increasing popularity of new types of construction using metallic facings, adversely affected building-stone output. The decline was more marked in the last quarter of 1956. Increased demand for crushed stone, particularly for road construction and agricultural use, partially offset the decline in dimension stone.

1956 was the first full year of gypsum mining in Indiana. The Martin County deposits yielded over twice as much crude gypsum as was produced in 1955.

In heavily industrialized Lake County over 10 percent of the Nation's pig iron was produced. Coke, anhydrous ammonia, dead-burned dolomite, and industrial refractories also were produced in that area.

---

[1] Commodity industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.
[2] Principal Geologist, Geological Survey, Indiana Department of Conservation, Bloomington, Ind.



Digitized by Google

**TABLE 1.—Mineral production in Indiana, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Abrasives (whetstones) | (2) | (2) | 3 | $5,322 |
| Clays | 1,729,299 | $2,938,010 | 2,050,620 | 3,457,110 |
| Coal | 16,149,310 | 58,000,085 | 17,089,433 | 64,061,096 |
| Lime | (2) | (2) | 80 | 960 |
| Marl, calcareous | 17,080 | 10,543 | 99,561 | 65,755 |
| Natural gas.....million cubic feet | 1,226 | 152,000 | 791 | 96,000 |
| Peat | 9,053 | 49,924 | 11,383 | 78,594 |
| Petroleum (crude)..thousand 42-gallon barrels | 10,988 | 31,980,000 | 11,513 | 33,733,000 |
| Sand and gravel | 17,081,982 | 14,306,348 | 16,666,985 | 14,353,088 |
| Stone | 14,124,406 | 34,679,589 | 14,700,025 | 31,574,890 |
| Value of items that cannot be disclosed: Cement, gypsum, recovered elemental sulfur, and values indicated by footnote 2 | ---------- | 43,837,863 | ---------- | 50,597,967 |
| Total Indiana [3] | ---------- | 183,479,000 | ---------- | 195,674,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total has been adjusted to eliminate duplicating value of clays and stone.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Coal.**—Coal continued to be Indiana's most valuable mineral product. Value of shipments in 1956 was about 10 percent higher than in the previous year. As in 1955, mines in the southwestern part of the State furnished a large share of the total. Warrick County again led the State in coal production and supplied nearly a third of the total. Coal mining in this area was spurred by the power requirements of atomic-energy developments in the Ohio Valley.

During 1956, 3 mobile loading machines, 1 continuous mining machine, 8 shuttle cars, and 1 "mother" conveyor were added to the equipment of Indiana mining operations.[3]

A Bureau of Mines report on analyses of tipple and delivered coal included data showing composition and quality of samples of coal from 11 Indiana mines.[4]

The Indiana Geological Survey published a map showing the coal geology of Clay County.[5]

---

[3] Coal Age, February 1957, pp. 72–74.
[4] Aresco, S. J., Haller, C. P., and Abernethy, R. F., Analyses of Tipple and Delivered Samples of Coal; Bureau of Mines Rept. of Investigations 5270, 1956, 66 pp.
[5] Indiana Geological Survey, Distribution, Structure, and Mined Areas of Coals in Clay County, Ind.; Prelim. 1956.

Digitized by Google

**TABLE 2.—Bituminous coal production, value, and number of mines operated in 1956, by counties**

(Exclusive of mines producing less than 1,000 net tons)

| County | Production (net tons) | | | Value | | Number of mines operated | | |
|---|---|---|---|---|---|---|---|---|
| | Underground | Strip | Total | Average per ton | Total | Underground | Strip | Total |
| Clay | | 849,183 | 849,183 | $3.84 | $3,257,047 | | 8 | 8 |
| Daviess | | 69,825 | 69,825 | 4.33 | 302,542 | | 2 | 2 |
| Dubois | 34,777 | | 34,777 | 2.70 | 93,898 | 4 | | 4 |
| Fountain | | 45,894 | 45,894 | 6.31 | 289,454 | | 1 | 1 |
| Gibson | 533,130 | 161,138 | 694,268 | 4.26 | 2,957,776 | 2 | 1 | 3 |
| Greene | 14,379 | 1,443,439 | 1,457,818 | 4.00 | 5,825,435 | 3 | 10 | 13 |
| Knox | 945,788 | 339,686 | 1,285,474 | 3.80 | 4,882,203 | 4 | 1 | 5 |
| Martin | | 10,075 | 10,075 | 4.14 | 41,683 | | 1 | 1 |
| Owen | | (1) | (1) | (1) | (1) | | 2 | 2 |
| Parke | | 20,649 | 20,649 | 5.98 | 123,454 | | 3 | 3 |
| Pike | 50,344 | 2,419,625 | 2,469,969 | 3.57 | 8,808,003 | 6 | 8 | 14 |
| Spencer | 4,643 | (1) | (1) | (1) | (1) | 1 | 2 | 3 |
| Sullivan | 498,624 | 448,975 | 947,599 | 4.00 | 3,786,215 | 4 | 4 | 8 |
| Vermillion | 23,495 | 248,898 | 272,393 | 4.00 | 1,088,938 | 3 | 2 | 5 |
| Vigo | 2,539,976 | 545,230 | 3,085,206 | 3.92 | 12,081,096 | 6 | 3 | 9 |
| Warrick | 529,881 | 5,078,176 | 5,608,057 | 3.48 | 19,512,032 | 10 | 10 | 20 |
| Undistributed | | 233,603 | 238,246 | 4.24 | 1,011,320 | | | |
| Total | 5,175,037 | 11,914,396 | 17,089,433 | 3.75 | 64,061,096 | 43 | 58 | 101 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.

**Peat.**—Peat production was reported from six counties during 1956—Blackford, De Kalb, Grant, Hamilton, Marion, and Wells. The output was sold for soil conditioning.

**TABLE 3.—Production of peat, 1947–56**

| Year | Number of producers reporting | Short tons | Value | Year | Number of producers reporting | Short tons | Value |
|---|---|---|---|---|---|---|---|
| 1947 | 4 | 3,957 | $14,760 | 1952 | 9 | 10,115 | $49,775 |
| 1948 | 3 | 2,288 | 11,576 | 1953 | 6 | 6,919 | 41,049 |
| 1949 | 7 | 7,949 | 28,537 | 1954 | 8 | 12,041 | 59,149 |
| 1950 | 5 | 5,793 | 18,966 | 1955 | 6 | 9,053 | 49,924 |
| 1951 | 5 | 5,699 | 22,824 | 1956 | 7 | 11,383 | 78,594 |

**Petroleum and Natural Gas.**—Petroleum production in 1956 increased over one-half million barrels to 11.5 million barrels. Natural-gas production totaled 791 million cubic feet in 1956.

The total number of wells drilled was 699, of which 488 were in proved fields and 211 were wildcats. This total figure included 251 oil producers, 9 gas producers, and 439 dry holes. Thirty-three successful exploratory wells, all in southwestern Indiana, resulted in the discovery of 10 new fields (including 1 gasfield), 13 extensions, and 10 new pays. Of these, the extensions were the most significant.[6]

Proved oil reserves in 1956 totaled approximately 67.8 million[7] barrels, as compared with 62 million barrels reported for 1955.

[6] Petroleum Section, Indiana Geological Survey.
[7] Carpenter, G. L., and Walker, F. H., Black Gold in Indiana; Ind. Business and Ind., Ind. Business Mag., Inc., vol. 1, No. 4. 1956.

Digitized by Google

TABLE 4.—Production of crude oil, 1956, by major fields [1]

| Field | County | Year discovered | Area (acres) | 1956 production (barrels) | Number of wells, 1956 | |
|---|---|---|---|---|---|---|
| | | | | | Producing | Completed |
| Caborn Consolidated | Posey | 1940 | 1,400 | 315,336 | 109 | 5 |
| College Consolidated | do | 1941 | 520 | 338,288 | 44 | 2 |
| Erskine | Vanderburgh | 1931 | 480 | 127,930 | 65 | 0 |
| Fairbanks | Sullivan | 1950 | 420 | 206,987 | 19 | 0 |
| Griffin Consolidated | Gibson and Posey | 1938 | 6,090 | 2,402,695 | 806 | 19 |
| Heusler Consolidated | Posey and Vanderburgh | 1938 | 1,400 | 145,868 | 84 | 0 |
| Inman East | Posey | 1943 | 240 | 120,870 | 30 | 3 |
| Lamott Consolidated | do | 1941 | 740 | 209,546 | 57 | 14 |
| Monroe City Consolidated | Knox | 1930 | 1,720 | 173,639 | 110 | 2 |
| Mount Carmel Consolidated | Gibson and Knox | 1941 | 1,660 | 262,484 | 159 | 0 |
| Mount Vernon Consolidated | Posey | 1941 | 1,800 | 557,616 | 159 | 8 |
| Mumford Hills | Gibson and Posey | 1940 | 680 | 137,114 | 52 | 8 |
| Owensville East Consolidated | Gibson | 1948 | 790 | 320,030 | 78 | 1 |
| Owensville North | do | 1943 | 1,710 | 120,703 | 100 | 3 |
| Patoka East | do | 1947 | 770 | 216,661 | 68 | 8 |
| Plainville | Daviess | 1950 | 350 | 117,831 | 57 | 0 |
| Rochester | Gibson | 1948 | 430 | 286,139 | 43 | 1 |
| Rock Hill (New) | Spencer | 1953 | 430 | 220,028 | 31 | 1 |
| Spencer | Posey | 1948 | 510 | 280,423 | 48 | (2) |
| Springfield Consolidated | do | 1946 | 1,900 | 440,416 | 226 | 12 |
| Terre Haute East | Vigo | 1951 | 380 | 106,859 | 19 | 1 |
| Union-Bowman Consolidated (New) | Gibson, Knox, and Pike | 1941 | 11,750 | 941,921 | 433 | 48 |
| Vienna | Vanderburgh | 1933 | 310 | 268,183 | 47 | (2) |
| Welborn Consolidated | Posey | 1941 | 1,320 | 382,714 | 112 | 3 |
| Undistributed | | | | 3,076,719 | 1,498 | 112 |
| Total | | | | 11,777,000 | 4,244 | 251 |

[1] Adapted from Dawson, T. A. and Carpenter, G. L., Oil Development and Production in Indiana during 1956: Indiana Department of Conservation, Geol. Survey Min. Econ. Ser. 3; Table 1.
[2] Correct entry not determinable.

## NONMETALS

**Abrasive Materials.**—Natural whetstones were produced from the Hindostan quarry near Orleans in Orange County. Indiana Sandstone Co. (Bedford) quarried a substantially increased output over the previous year.

**Cement.**—Indiana cement shipments remained about the same as in 1955. The price per barrel of both portland and masonry cements increased, resulting in a 13-percent rise in the value of shipments in 1956. Portland and masonry cements were produced by Louisville Cement Co., Speed; Universal Atlas Cement Co., Buffington; Lehigh Portland Cement Co., Mitchell; and Lone Star Cement Corp., Limedale. Natural cement also was produced at the Speed plant by Louisville Cement Co.

**Clays.**—Clay production in 1956 was substantially greater than in 1955. Tonnage of miscellaneous clay mined increased 17 percent; fire-clay production was 22 percent higher than in 1955. Production was reported from 26 counties. Miscellaneous clay was mined in 24 counties and used to manufacture cement and heavy clay products (brick, tile, and related products). Fire clay was mined in eight counties and used in refractories, firebrick, stoneware, art pottery, high-grade tile, and heavy clay products.

Midwest Aggregates, Inc., expanded shale for use as lightweight aggregate at a plant in Brooklyn. The raw material was mined from the New Providence shale of the Borden group.

Digitized by Google

TABLE 5.—Clays sold or used by producers, 1947–51 (average) and 1952–56

| Year | Fire clay | | Miscellaneous clay | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 428,037 | $729,721 | 896,984 | $782,804 | 1,325,021 | $1,512,525 |
| 1952 | 397,336 | 732,025 | 933,962 | 968,184 | 1,331,298 | 1,700,209 |
| 1953 | 582,639 | 1,163,687 | 1,071,473 | 1,350,540 | 1,654,112 | 2,514,227 |
| 1954 | 374,081 | 700,044 | 1,571,988 | 2,290,672 | 1,946,069 | 2,990,716 |
| 1955 | 529,310 | 1,020,703 | 1,199,989 | 1,917,307 | 1,729,299 | 2,938,010 |
| 1956 | 645,254 | 1,201,863 | 1,405,366 | 2,255,247 | 2,050,620 | 3,457,110 |

The Indiana Geological Survey estimated the value of products manufactured from clays at $27 million.

**Gypsum.**—Gypsum deposits near Shoals, Martin County, were mined by National Gypsum Co. and United States Gypsum Co. The crude gypsum was processed in mills adjoining the mines, and wallboard, lath, prepared plasters, and other products were manufactured.

**Lime.**—The Indiana State Farm, Putnam County, produced a small quantity of quicklime for its own use. The limestone used in lime manufacture was quarried on the property.

**Marl, Calcareous.**—Marl production was reported in 7 counties in northern Indiana: Elkhart, Fulton, Kosciusko, Lagrange, La Porte, Noble, and Steuben. The output was used for agricultural purposes.

TABLE 6.—Production of calcareous marl, 1951–56

| Year | Number of producers reporting | Short tons | Value | Year | Number of producers reporting | Short tons | Value |
|---|---|---|---|---|---|---|---|
| 1951 | 4 | 12,960 | $18,129 | 1954 | 6 | 28,536 | $18,515 |
| 1952 | 5 | 16,414 | 9,021 | 1955 | 5 | 17,080 | 10,543 |
| 1953 | 4 | 13,540 | 6,398 | 1956 | 8 | 99,561 | 65,755 |

**Perlite.**—Crude perlite, mined in Western States, was expanded for use as lightweight aggregate for plaster and concrete by Federal Cement Tile Co., Chicago, Ill., at its plant at Hammond and by Airlite Processing Corp. (Vienna).

**Sand and Gravel.**—Sand and gravel was produced throughout the State in 67 counties. Production was about 2 percent less than in 1955, but total value was slightly higher in 1956 due to increased prices. Increases in the use of sand and gravel for road construction were offset by declines in the tonnages used for building construction and industrial purposes.

The Indiana Geological Survey released a publication concerning beneficiation of sand for glass and other high-silica purposes,[8] and exploration by private industry resulted in the location of a 25-million-ton deposit of sand suitable for beneficiation in Harrison County. The deposit is 1½ miles from the Ohio River in the Ohio River formation.

[8] Pinsak, A. P., High-Silica-Sand Potentialities of the Ohio River Formation: Indiana Dept. Cons., Geol. Survey Bull. 9, 1956, 54 pp.

Digitized by Google

The 10 leading producers of sand and gravel were: American Aggregates Corp., Greenville, Ohio; Irving Bros. Gravel Co., Marion; Kickapoo Sand & Gravel Corp., Peru; Koch Sand & Gravel Co., Evansville; Material Service Corp., Chicago, Ill.; Myers Gravel & Sand Co., Inc., Anderson; Portage-Manley Sand Co., Rockton, Ill.; Spickelmier Co., Indianapolis; Standard Materials Corp., Indianapolis; and Western Indiana Gravel Co., Lafayette.

**TABLE 7.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Molding | 891,641 | $1,129,676 | $1.27 | 410,338 | $569,589 | $1.39 |
| Building | 4,005,960 | 2,667,631 | .67 | 3,097,941 | 2,308,873 | .75 |
| Paving | 2,448,005 | 1,876,079 | .77 | 3,120,180 | 2,649,660 | .85 |
| Grinding and polishing | 16,381 | 7,977 | .49 | | | |
| Engine | 109,801 | 80,454 | .73 | 95,497 | 71,551 | .75 |
| Other | 107,803 | 81,807 | .76 | 128,740 | 87,989 | .68 |
| Undistributed [1] | 69,644 | 61,841 | .89 | 170,000 | 203,943 | 1.20 |
| Total sand | 7,649,235 | 5,905,465 | .77 | 7,022,696 | 5,891,605 | .84 |
| Gravel: | | | | | | |
| Building | 3,300,897 | 3,231,593 | .98 | 3,262,212 | 2,989,025 | .92 |
| Paving | 4,716,481 | 4,321,254 | .92 | 5,289,760 | 4,762,624 | .90 |
| Railroad ballast | 485,416 | 392,777 | .81 | 412,335 | 345,618 | .84 |
| Other | 372,607 | 227,712 | .61 | 232,124 | 155,355 | .67 |
| Total gravel | 8,875,401 | 8,173,336 | .92 | 9,196,431 | 8,252,622 | .90 |
| Total sand and gravel | 16,524,636 | 14,078,801 | .85 | 16,219,127 | 14,144,227 | .87 |
| GOVERNMENT-AND-CONTRACTOR | | | | | | |
| Sand: Paving | | | | 25,102 | 10,650 | .42 |
| Gravel: | | | | | | |
| Building | | | | 43,056 | 17,222 | .40 |
| Paving | 557,346 | 227,547 | .41 | 379,700 | 180,989 | .48 |
| Total gravel | 557,346 | 227,547 | .41 | 422,756 | 198,211 | .47 |
| Total sand and gravel | 557,346 | 227,547 | .41 | 447,858 | 208,861 | .47 |
| ALL OPERATIONS | | | | | | |
| Sand | 7,649,235 | 5,905,465 | .77 | 7,047,798 | 5,902,255 | .84 |
| Gravel | 9,432,747 | 8,400,883 | .89 | 9,619,187 | 8,450,833 | .88 |
| Grand total | 17,081,982 | 14,306,348 | .84 | 16,666,985 | 14,353,088 | .86 |

[1] Includes fire or furnace, filter, glass, and railroad ballast sands to avoid disclosing individual company confidential data.

**Slag.**—Slag, a byproduct of blast-furnace operations in the Lake County industrial area was crushed for use as aggregate and as a raw material in the manufacture of cement, and expanded for use as insulating material and lightweight aggregate.

**Stone.**—Stone produced in Indiana was valued at $31.6 million—a decrease of over $3 million from 1955. Dimension-limestone sales

Digitized by Google

declined 23 percent. Two factors explained the decline—a decreased amount of building generally and an increased use of competitive materials in facing buildings. Building-stone production was centered in Lawrence and Monroe Counties, where the Salem limestone formation has been quarried for 150 years. Quarries and mills are located in and near the towns of Bedford and Bloomington. A map showing geology and other economic aspects of this dimension stone district was published by the Indiana Geological Survey.[9]

Leading producers of dimension limestone were: Indiana Limestone Co., Ingalls Stone Co., and Heltonville Limestone Co., Bedford; Bloomington Limestone Corp., Empire Stone Co., B. G. Hoadley Quarries, Inc., and Victor Oolitic Stone Co., Bloomington.

The production and value of crushed limestone increased 5 percent over 1955. Larger tonnages of crushed limestone for agricultural use and in concrete aggregate and road construction furnished much of the gain. Production was reported from 39 counties. The leading counties, in order of value, were: Putnam, Clark, Lawrence, Monroe, and Allen. Major producers of crushed stone included Erie Stone Co., Louisville Cement Co., Mulzer Bros., Ohio & Indiana Stone Corp., and Pipe Creek Stone Co. A map published by the Indiana Geological Survey showed the distribution of crushed-stone quarries throughout the State.[10]

Dimension sandstone was quarried in Lawrence County by Indiana Sandstone Co., Inc., of Bedford and in Martin County by French Lick Sandstone Co., Inc., of French Lick. John H. Hinkle of Bloomington opened a quarry in Monroe County in June 1956 to produce dimension sandstone.

General Refractories Co., Philadelphia, Pa., quarried in a quartz-pebble conglomerate of the Mansfield formation near Shoals in Martin County. The material was washed and sized and shipped by rail for refractory purposes.

The Indiana Geological Survey issued a directory of crushed-limestone producers in Indiana during 1956. The report reviewed the history of the crushed-stone industry in the State, provided data on distribution and stratigraphy of various rock systems, and listed limestone producers.[11]

A report on drift thickness by the Indiana Geological Survey showed general overburden conditions for quarrying in the northern three-fifths of the State.[12]

**Sulfur.**—Byproduct sulfur was recovered from crude petroleum by the Standard Oil Co. of Indiana at Whiting. The Mathieson-Fluor process was used.

---

[9] Smith, N. M., Map of Bedford Bloomington Dimension Stone Belt Showing Mills, Quarries, and Outcrop of Salem Limestone; Indiana Geol. Survey Atlas of Min. Res. Map 8, 1956.

[10] McGregor, D. J., Patton, J. B., and Smith, N. M., Map of Indiana Showing Crushed Stone and Dimension Stone Operations Outside of Bedford-Bloomington Dimension Stone Belt, Indiana: Geol. Survey Atlas of Min. Res. Map 7, 1956.

[11] McGregor, D. J., Directory of Crushed-Limestone Producers in Indiana; Indiana Geol. Survey Directory 4, 1956, 56 pp.

[12] Wayne, W. J., Thickness of Drift and Bedrock Physiography of Indiana North of the Wisconsin Glacial Boundary; Indiana Geol. Survey Rept. of Prog. 7, 1956, 70 pp.



Digitized by Google

TABLE 8.—Limestone sold or used by producers, 1955–56, by uses

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Quantity | Value | | Quantity | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| Dimension: | | | | | | |
| Building: | | | | | | |
| Rough architectural cubic feet | 3,725,392 | $4,204,560 | $1.13 | 3,185,090 | $3,592,069 | $1.13 |
| Dressed (cut and sawed) cubic feet | 5,547,378 | 14,289,137 | 2.58 | 3,612,995 | 10,546,860 | 2.92 |
| Flagging and rubble cubic feet | 276,676 | 35,568 | .13 | 1,059,090 | 211,352 | .20 |
| Total (short tons approximate) [1] | 692,335 | 18,529,265 | 26.76 | 569,645 | 14,350,281 | 25.19 |
| Crushed and broken: | | | | | | |
| Riprap short tons | 455,815 | 487,673 | 1.07 | 359,329 | 171,256 | .48 |
| Flux do | 118,930 | 147,296 | 1.24 | 135,210 | 169,267 | 1.25 |
| Concrete aggregate, roadstone, etc. short tons | 8,302,582 | 10,060,054 | 1.21 | 8,677,549 | 10,721,535 | 1.24 |
| Railroad ballast do | 270,255 | 308,536 | 1.14 | 158,140 | 191,663 | 1.21 |
| Agriculture do | 2,078,669 | 2,575,569 | 1.24 | 2,446,561 | 3,143,022 | 1.28 |
| Other [2] do | 2,181,694 | 1,993,418 | .91 | 2,277,993 | 2,009,326 | .88 |
| Total crushed and broken short tons | 13,407,945 | 15,572,546 | 1.16 | 14,054,782 | 16,406,069 | 1.17 |
| Grand total do | 14,100,280 | 34,101,811 | 2.42 | 14,624,427 | 30,756,350 | 2.10 |

[1] 145 pounds per cubic foot.
[2] Includes limestone for refractory, calcium carbide plants, glass factories, paint and rubber filler, pottery, asphalt, fertilizer, dust for coal mines, mineral food, mineral wool, cement, and other uses.

## REVIEW BY COUNTIES

**Adams.**—The Krick Tyndall Co. (Findlay, Ohio) mined clays from a pit near Decatur for use in heavy clay products. Sand and gravel for building construction and miscellaneous use was produced by Lybarger Gravel Co. (Geneva). Crushed limestone for construction aggregate and agricultural use was quarried by John W. Karch Stone Co., Bryant; and Meshberger Bros. Stone Corp., Linn Grove.

**Allen.**—Miscellaneous clay for use in heavy clay products was mined by Walter A. Bolyard Tile Co. (Monroeville). Sand and gravel for building and road construction was produced by Paul C. Brudi Stone & Gravel Co. and May Sand & Gravel Corp., Fort Wayne; and W. W. Gravel Co., Inc., Roanoke. May Sand & Gravel Corp. also quarried and crushed limestone for construction aggregate.

**Bartholomew.**—Sand and gravel for building construction was produced by Driftwood Gravel Co. (Columbus) from a site near Edinburg. The county highway department contracted for road sand and gravel. Meshberger Stone Co. (Columbus) quarried and crushed limestone for construction aggregate and agricultural and refractory use.

**Benton.**—Gravel for road maintenance was produced by Mount Gilboa Gravel Co. (Fowler), from a site near Remington.

Digitized by Google

**TABLE 9.—Value of mineral production in Indiana, 1955–56, by counties [1] [2]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [3] |
|---|---|---|---|
| Adams | $576,479 | $510,736 | Stone, clays, sand and gravel. |
| Allen | 841,629 | 1,287,103 | Stone, sand and gravel, clays. |
| Bartholomew | 291,673 | 342,139 | Stone, sand and gravel. |
| Benton | 5,738 | 2,910 | Sand and gravel. |
| Blackford | 144,000 | 127,622 | Stone, peat, clays. |
| Boone | 36,511 | 32,035 | Sand and gravel. |
| Carroll | (3) | (3) | Stone, sand and gravel. |
| Cass | 494,136 | (3) | Do. |
| Clark | (3) | (3) | Cement, stone, sand and gravel, clays. |
| Clay | 3,719,541 | 4,074,119 | Coal, clays, sand and gravel. |
| Clinton | 9,475 | 30,322 | Sand and gravel. |
| Crawford | (3) | (3) | Stone. |
| Daviess | 338,522 | 477,158 | Coal, clays, sand and gravel. |
| Dearborn | 194,780 | 209,266 | Sand and gravel. |
| Decatur | 231,029 | (3) | Stone. |
| De Kalb | 223,145 | 286,729 | Sand and gravel, peat. |
| Delaware | 574,192 | 487,941 | Stone, sand and gravel. |
| Dubois | 154,894 | 151,847 | Coal, clays, sand and gravel. |
| Elkhart | 287,422 | 286,281 | Sand and gravel, marl. |
| Fayette | 93,565 | 97,841 | Sand and gravel. |
| Fountain | 668,108 | 606,447 | Coal, sand and gravel, clays. |
| Franklin | 900 | (3) | Clays. |
| Fulton | 46,066 | 74,594 | Sand and gravel, marl. |
| Gibson | 2,881,093 | 3,071,174 | Coal, sand and gravel. |
| Grant | 1,224,426 | 1,271,637 | Stone, sand and gravel, peat. |
| Greene | 5,014,027 | 6,110,449 | Coal, clays, sand and gravel, stone. |
| Hamilton | 483,543 | (3) | Stone, sand and gravel, peat. |
| Hancock | 72,136 | 83,509 | Sand and gravel. |
| Harrison | 89,727 | 107,450 | Stone. |
| Hendricks | 79,006 | (3) | Sand and gravel. |
| Henry | 32,930 | 33,851 | Do. |
| Howard | 400,900 | 386,499 | Stone, sand and gravel. |
| Huntington | (3) | (3) | Stone, clays. |
| Jackson | 348,699 | 323,469 | Clays, sand and gravel. |
| Jasper | 275,240 | 195,000 | Stone, sand and gravel. |
| Jay | 81,600 | (3) | Stone. |
| Jennings | 249,397 | (3) | Do. |
| Knox | 4,822,178 | 5,172,969 | Coal, sand and gravel. |
| Kosciusko | 293,722 | 371,745 | Sand and gravel, marl. |
| Lagrange | (3) | (3) | Do. |
| Lake | (3) | (3) | Cement, sulfur, clays, sand and gravel. |
| La Porte | 510,956 | (3) | Sand and gravel, marl. |
| Lawrence | 15,454,700 | 12,808,478 | Stone, cement, sand and gravel. |
| Madison | 745,862 | 713,479 | Stone, sand and gravel. |
| Marion | 2,589,898 | 2,240,318 | Sand and gravel, peat. |
| Marshall | 86,296 | 71,575 | Sand and gravel, clays. |
| Martin | (3) | 2,455,500 | Gypsum, stone, clays, coal. |
| Miami | 509,183 | 484,955 | Sand and gravel. |
| Monroe | 9,279,291 | 8,639,679 | Stone. |
| Montgomery | 102,140 | 100,541 | Clays, sand and gravel. |
| Morgan | 389,180 | 386,827 | Do. |
| Newton | 579,000 | 598,000 | Stone. |
| Noble | 28,825 | 18,891 | Sand and gravel, marl. |
| Orange | 698,810 | 301,482 | Stone, abrasives. |
| Owen | 1,386,160 | 1,542,738 | Coal, stone, clays, sand and gravel. |
| Parke | 493,195 | 576,135 | Clays, sand and gravel, coal, stone. |
| Perry | (3) | (3) | Stone, clays. |
| Pike | 7,272,793 | 8,808,003 | Coal. |
| Porter | 377,102 | 349,826 | Sand and gravel, clays. |
| Posey | 116,923 | 127,151 | Sand and gravel. |
| Pulaski | 579,225 | 519,616 | Stone, clays, sand and gravel. |
| Putnam | (3) | (3) | Cement, stone, clays, sand and gravel, lime. |
| Randolph | 212,348 | 205,183 | Stone, sand and gravel. |
| Ripley | 169,310 | 163,156 | Do. |
| Rush | 185,951 | 238,399 | Do. |
| St. Joseph | 621,542 | 775,024 | Sand and gravel. |
| Scott | 265,951 | 257,507 | Stone. |
| Shelby | 569,853 | 548,529 | Stone, sand and gravel. |
| Spencer | (3) | (3) | Coal, sand and gravel. |
| Starke | (3) | 59,510 | Sand and gravel. |
| Steuben | 244,788 | 206,677 | Sand and gravel, marl. |
| Sullivan | 4,883,367 | 3,941,419 | Coal, sand and gravel. |
| Switzerland | 60,450 | 81,773 | Stone. |
| Tippecanoe | 703,189 | 769,700 | Sand and gravel. |
| Vanderburgh | (3) | 436,980 | Sand and gravel, clays. |
| Vermillion | 1,487,716 | 1,739,377 | Coal, sand and gravel, clays. |
| Vigo | 11,045,094 | 12,249,865 | Do. |
| Wabash | 49,857 | 53,404 | Sand and gravel. |
| Warren | 1,000 | (3) | Do. |

**See footnotes at end of table, p. 10.**

Digitized by Google

**TABLE 9.—Value of mineral production in Indiana, 1955–56, by counties [1] [2]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Warrick | $17,902,693 | $19,673,032 | Coal, stone, sand and gravel. |
| Wayne | 567,914 | 605,363 | Sand and gravel, stone. |
| Wells | 345,329 | 297,055 | Stone, peat, sand and gravel. |
| White | 418,400 | 580,600 | Stone. |
| Whitley | (3) | (3) | Sand and gravel. |
| Undistributed | 77,264,728 | 88,185,193 | |
| Total | 183,479,000 | [4] 195,674,000 | |

[1] The following counties are not listed because no production was reported: Brown, Floyd, Jefferson, Johnson, Ohio, Tipton, Union, and Washington.
[2] Except for natural gas and petroleum, which was not available by counties. Value of these commodities is included with "Undistributed."
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[4] Total has been adjusted to eliminate duplicating value of clays and stone.

**Blackford.**—Miscellaneous clay for use in heavy clay products was mined by Inman Tile Co., (Hartford City). Reed or sedge peat was produced by Hartford Peat & Gravel Co. from a bog near Hartford City. Montpelier Stone Co. (Montpelier) quarried and crushed limestone for construction aggregate and agricultural stone.

**Boone.**—Sand and gravel for building, road construction, and miscellaneous use was produced by Harold Blacker, Colfax; W. K. Murray, Frankfort, near Thorntown; Glen Reagan, Lebanon; and Routh Gravel Plant, Zionsville. Harold Blacker and W. K. Murray produced by dredging.

**Carroll.**—Brim Gravel Transit Mix Co., Inc. (Flora), Chester Brovont (Camden), and Lloyd Gangwer (Cutler), produced sand and gravel for building and miscellaneous use. Stuntz-Yeoman Co. (Delphi) quarried and crushed limestone for concrete aggregate and agricultural stone.

**Cass.**—Building sand was produced by Greenville Gravel Co. (Logansport) and the county highway department contracted for road gravel. Near Logansport, Cass County Stone Co., (Logansport) and The France Stone Co. (Toledo, Ohio) quarried limestone for use as flux, aggregate, railroad ballast, and agricultural stone.

**Clark.**—Louisville Cement Co. (Louisville, Ky.) produced masonry, natural, and portland cements at its plant at Speed. The company also mined clays and quarried limestone to manufacture cement. In addition to the Louisville Cement Co., other producers of crushed limestone in the county were T. J. Atkins & Co., Jeffersonville; and Sellersburg Stone Co., Sellersburg. The limestone was used for riprap, aggregate, and agricultural purposes. Yoder Same (Jeffersonville) produced sand for building purposes.

**Clay.**—Coal from strip mines was the principal mineral produced in the county. Producers were: Ayrshire Collieries Corp., Brown Coal Co., G & F Corp., Gillespie Coal Co., Log Cabin Coal Co., Quality Coal Corp., Ren Coal Co., and Turner, Thompson & Albin Coal & Clay Co. Fire and miscellaneous clays, for use in pottery and stoneware, refractories, and heavy clay products, were mined by American Vitrified Products Co., Cleveland, Ohio, near Brazil; G & F Corp., Log Cabin Coal Co., Love Bros. Clay & Coal Co., Ren Coal Co., and S. L. Turner Coal & Clay Co., all of Brazil; and Brown Coal Co. and Quality Coal Co., both of Centerpoint. Clyde Bullerdick Gravel

Digitized by Google

Co. (Poland) produced sand and gravel for road construction by dredging near Brazil.

**Clinton.**—Joe Conrad (Frankfort) produced road gravel from dredging near Jefferson. The county highway department contracted for road gravel.

**Crawford.**—Limestone for riprap, aggregate, and agricultural use was mined underground and crushed by Hy-Rock Products Co. (Marengo). Mulzer Bros. (Tell City) operated a large quarry and crushing plant near Eckerty.

**Daviess.**—Clays for use in heavy clay products were mined by Kretz Brick Co. (Washington) near Montgomery. Hicks Coal Co. and Loogootee Block Coal Co. strip-mined coal. John E. Mize (Elnora) and Western Sand & Gravel (Plainville) dredged sand and gravel for use in building, road construction, and miscellaneous purposes.

**Dearborn.**—Dearborn Gravel Co. (Lawrenceburg) and Laughery Gravel Co., Inc. (Aurora) produced sand and gravel for building and road construction.

**Decatur.**—Limestone for riprap, construction aggregate, and agricultural use was quarried by Harris City Stone Co., Greensburg; Layton Stone Co., Westport; and New Point Stone Co., Batesville, from a site near New Point.

**De Kalb.**—Moss and humus peat was produced by Humus Peat Moss Co., Corunna. Sand and gravel for building and road construction was produced by Burtzner Bros. & Wilhelm, Waterloo; Tom Day, and Flegal, Inc., both of Hamilton; Irving Gravel Co., Inc., Harlan (from a site near Spencerville); and Harold J. Krafft, Spencerville.

**Delaware.**—Muncie Excavating Co. and Park Sand & Gravel, Inc., (both of Muncie) produced sand and gravel for building, road construction, and miscellaneous uses. Crushed limestone for aggregate was produced by J & K Stone, Inc. (Muncie).

**Dubois.**—Fire and miscellaneous clays for use in heavy clay products were mined by Hugo H. Bartelt and Huntingburg Brick Co. (both of Huntingburg). Fire clay for stoneware and pottery was mined by Louisville Pottery Co. from a pit near Huntingburg. Production came from underground and open pits. Coal from underground mines was produced by Simon Ackerman Coal Mine, Mehringer & Frick, Stenftenagel Coal Co., and Tedrow Coal Co. Hoffman Sand & Gravel Co. (Jasper) produced building sand.

**Elkhart.**—Marl for agricultural purposes was mined from open pits by Ashliman & Weirich (Goshen) and E. M. Ulmer & Sons (Etna Green) from a site near Elkhart. Sand and gravel for building, road construction, and miscellaneous use, was reported by Christner Gravel Co., Inc., Goshen; Goshen Sand & Gravel, Goshen (from a site near New Paris); and Yoder Ready Mix Concrete Co., Inc., Elkhart.

**Fayette.**—Sand and gravel for building and road construction was produced by Connersville Gravel Co., Inc., and Grubbs Bros. (both of Connersville). Grubbs Bros. production came from dredging.

**Fountain.**—Clays for use in heavy clay products and chemicals were mined from open pits by Hydraulic-Press Brick Co., Crawfordsville; Poston-Herron Brick Co., Attica; and Rostone Corp., Lafayette. Morgan Coal Co. mined coal from a strip operation. Sand and gravel

Digitized by Google

for building and road construction was produced by Neal Gravel Co., Inc., Covington; and Towell & Towell, Kingman.

**Franklin.**—Herman H. Wessel Co. (Batesville) mined clays for use in heavy clay products from an open pit near Huntersville.

**Fulton.**—Marl for agricultural purposes was mined by Clarence Sampsel & Sons, Rochester (from a site near Akron), and M. E. Zellers, Kewanna. Production of sand and gravel for building and road construction was reported by Bert & Cecil Davis, Leiters Ford; C. G. Smith, Akron; and George E. Metzger and Van Duyne Block & Gravel Co., Rochester.

**Gibson.**—Coal was mined underground by Princeton Mining Co. and Somerville Coal Co. and from a strip mine by Saxton Coal Corp. Charles A. Griffin (Princeton) and Jewel Guller (Owensville) dredged sand and gravel for road construction near Johnson.

**Grant.**—Moss peat was produced by Glacier Peat Moss Co. (Jonesboro). Railroad ballast and sand and gravel for building and road construction were produced by Irving Bros. Gravel Co., Inc. (Marion). Pipe Creek Stone Co. (Marion) produced dimension and crushed limestone near Swayzee, for use as flagging, riprap, flux, aggregate, and railroad ballast and for agricultural purposes.

**Greene.**—Bloomfield Brick Co., Inc. (Bloomfield) mined clays for use in heavy clay products. Coal was the principal mineral produced in the county and came from 3 underground and 10 strip mines. Producers were: Monarch Coal Co., Inc., Richardson Coal Co., and South Linton Coal Co. (all underground); and Ax Coal Corp., Comet Collieries, Inc., Lambright Coal Co., Al Lohr Coal, Inc., Maumee Collieries Co., Rose Hill Coal Co., and Sherwood-Templeton Coal Co. (all strip). Sand and gravel for building, road construction, and miscellaneous use was produced by Concrete Silo Co., Inc., and Nocus & Schofield Gravel Plant (both of Bloomfield). Gordan & Shepherd Stone Co. quarried and crushed limestone for aggregate and agricultural use.

**Hamilton.**—Fox Prairie Products, Inc. (Indianapolis) produced moss peat near Noblesville. Filter sand and sand and gravel for building, road construction, and miscellaneous use were produced. Producers operating in the county were: Curt Ayers, Lebanon (from a site near Bakers Corner); Carmel Gravel Corp., Carmel; F. Beaver & Sons, Inc., Clark Materials, Chauncey Craig (from dredge operations), Newton Gravel Co., and Mrs. Clarence Russell, all of Noblesville; and Irving Materials, Inc., Fortville (the Reservoir plant). Stony Creek Stone Co. (Noblesville) quarried and crushed limestone for aggregates.

**Hancock.**—Delbert L. Reeves and Ed. Strubbe & Son (both of Greenfield) produced gravel for building and road construction.

**Harrison.**—Davis Crushed Stone & Lime Co. (Ransey) and Mathes Stone Co. (Corydon) quarried limestone for riprap, aggregate, and agricultural use.

**Hendricks.**—Sand and gravel for building and paving was produced by Standard Materials Corp. (Indianapolis).

**Henry.**—Sand and gravel for building and road construction was produced by Cooper & Priest, Frances L. Craig (from a site near Greensboro), Harry I. McNew & Sons, all of Knightstown; Irving Materials, Inc., Fortville (operating the New Castle plant); Jasper L.

Digitized by Google

McDonald, Honey Creek; and Alpha Riley, Middletown. Road gravel was produced by and for the county highway department.

**Howard.**—Dimension and crushed limestone was produced by Yeoman Stone Co. (Kokomo) for flagging, aggregate, and agricultural use. Some sand and gravel also was produced in the county.

**Huntington.**—Clays for heavy clay products were mined by Majenica Tile Co. (Huntington) from a site near Majenica. The Erie Stone Co. (Toledo, Ohio) quarried limestone near Huntington for flux, aggregate, railroad ballast, and agricultural and other miscellaneous uses.

**Jackson.**—Lehigh Portland Cement Co. (Allentown, Pa.) mined clays for use in manufacturing cement from a pit near Brownstown. Medora Brick & Tile Co. (Medora) mined clays for use in heavy clay products. Production of sand and gravel for building and road construction was reported by Medora Concrete Block Plant, Brownstown (from dredging near Vallonia); and Spray Gravel Co., Seymour.

**Jasper.**—Sand and gravel for building and road construction was produced by Peter Dziabis (from dredging) and Rensselaer Gravel Co. (both of Rensselaer). W. C. Babcock Construction Co., Inc. (Rensselaer) quarried and crushed limestone for aggregate and agricultural use.

**Jay.**—Dolomite for aggregate and agricultural use was quarried and crushed by Rockledge Products Co. (Portland).

**Jennings.**—Paul Frank, Inc. (North Vernon) quarried and crushed limestone for aggregate and agricultural use.

**Knox.**—Coal was mined underground by Diamond Coal Co., Enoco Collieries, and Wolfe-Koenig Corp. and from a strip operation by Shasta Coal Corp. Production of sand and gravel for building, road construction, and miscellaneous use, was reported by Lenahans & Konen, Inc., White River Materials Co. (both from dredging), and Knox County Sand Co. (all of Vincennes).

**Kosciusko.**—E. M. Ulmer & Sons (Etna Green) mined marl for agricultural use from a site near Atwood. Engine sand and sand and gravel for building, road construction, and miscellaneous use was produced in the county. Producers were Fuller's General Hauling, Estate of Roy R. Ruse, and Seth Yeiter, all of Warsaw; Sturm & Dillard Gravel Co., Syracuse; Western Indiana Gravel Co., Lafayette (from a site near Leesburg); and the county highway department.

**Lagrange.**—Marl from underground quarrying was produced by Glen Hesher (Howe). It was used for agricultural purposes. Sand and gravel for building, road construction, and miscellaneous use was produced by Northup Gravel Co. and Vern A. Pant, both of Lagrange; Wolcottville Sand & Gravel Corp., Wolcottville; and the county highway department.

**Lake.**—Universal Atlas Cement Co. (New York, N. Y.) produced portland and masonry cements at the company plant at Buffington. Clays from an open pit were mined by National Brick Co. (Chicago, Ill.), at a site near Munster. Output was used in manufacturing heavy clay products. John N. Bos Sand Co. (Chicago, Ill.) produced molding, building, road, and engine sand from a site near Gary. J. K. Hall & Sons (Lowell) produced building and road sand from dredging. Standard Oil Co. of Indiana (Chicago, Ill.) recovered

Digitized by Google

byproduct sulfur by the Mathieson-Fluor process. The entire production was used in its refinery at Whiting.

**La Porte.**—E. M. Ulmer & Sons (Etna Green) mined marl for agricultural use from a site near Walkerton. Molding and engine sand and sand and gravel for building and road construction were produced in the county. Producers were Clyde A. Bean, Rolling Prairie; J & A Gravel Co., Walkerton (from dredging); Portage-Manley Sand Co. (Rockton, Ill.) and Producers Core Sand Corp., both at Michigan City; and Gus Swanson, La Porte.

**Lawrence.**—Lehigh Portland Cement Co. (Allentown, Pa.) produced portland and masonry cements and limestone at Mitchell for use in manufacturing cement. Production of road gravel was reported by the C. E. Flynn Estate (Bedford). Indiana Sandstone Co., Inc. (Bedford) quarried dimension sandstone for architectural use. Dimension limestone for building purposes was quarried and milled by Heltonville Limestone Co., Indiana Limestone Co., Inc., and Ingalls Stone Co., all of Bedford. Several other fabricators processed purchased stone. Producers of crushed limestone were Oolitic Ground Limestone Co., Bedford; Mitchell Crushed Stone Co., Inc., Mitchell; and Ralph Rogers & Co., Inc., Bloomington (quarry at Springville). Uses were for riprap, aggregate, railroad ballast, glass, and agricultural and other miscellaneous purposes. Bedford Ground Limestone Co. crushed spalls at Bedford from building stone mills.

**Madison.**—Sand and gravel for building, road construction, and miscellaneous use was produced by Armfield Gravel Co., Myers Gravel & Sand Co., Inc., Riggs Equipment Co., and Western Indiana Gravel Co. (all at Anderson). Standard Materials Corp. (Lapel) quarried limestone for riprap, aggregate, and agricultural purposes.

**Marion.**—Humus peat was produced by Peat Moss Indianapolis, Inc. (Indianapolis). Sand and gravel for building, road construction, and railroad ballast was produced in the county. Producers were: American Aggregates Corp., Greenville, Ohio (from two sites near Indianapolis); and Schuster Coal Co., Standard Materials Corp., and Spickelmier Co., all of Indianapolis.

**Marshall.**—Bremen Tile & Sawmill, Inc. (Bremen) mined clays for use in heavy clay products. Sand and gravel for building, road construction, and miscellaneous use, was reported by David Stayton, Argos; Mutti Gravel Pit and Noble Reese, both of Bremen; Burr Oak Sand & Gravel Co., Culver; and Fred Appleman, Floyd Bottorff, Sr., and O. S. Goss & Sons, all of Plymouth.

**Martin.**—Clays for heavy clay products were mined by Loogootee Clay Products Corp. (Loogootee). Coal was strip-mined by Loogootee Block Coal Co., Inc. National Gypsum Co. and United States Gypsum Co. (both at Shoals) mined gypsum for manufacturing plaster and wallboard and for use as a portland-cement retarder, in agriculture (land plaster), and for industrial purposes. General Refractories Co. (Philadelphia, Pa.) quarried a quartz-pebble conglomerate near Shoals for use in manufacturing silica brick. The French Lick Sandstone Co., Inc., quarried dimension sandstone near Trinity Springs.

**Miami.**—Kickapoo Sand & Gravel Co. and Jess Richardson (both of Peru) and J. C. O'Connor & Sons, Inc. (Fort Wayne, operating

Digitized by Google

from a site near Peru), produced sand and gravel for building, road construction, railroad ballast, and miscellaneous use.

**Monroe.**—Nearly three-fifths of the dimension limestone produced in Indiana came from Monroe County quarries. Active quarries in the Bloomington area were: Bloomington Limestone Corp., Empire Stone Co., B. G. Hoadley Quarries, Inc., Independent Limestone Co., Midwest Quarries Co., Inc., Solomito Stone Co., Inc., Texas Quarries, Inc., Victor Oolitic Stone Co., Woolery Stone Co., Inc., The Carl Furst Co., Indiana Limestone Co., and Ingalls Stone Co. In addition to mills operated in conjunction with some of the quarries, purchased stone was cut and dressed by 12 mills in the area. Several additional companies sawed stone and split it for veneer, and others split stone purchased in sawed form. Stone was crushed by Bloomington Crushed Stone Co., Inc., at Bloomington. The Indiana Calcium Corp. (Bloomington) fine-grinding plant produced high-calcium limestone from mill spalls purchased from local stone mills. The output was sold for filler, coal mine rock dust, mineral food, and for agricultural use.

**Montgomery.**—American Vitrified Products Co. (Cleveland, Ohio, from a pit near Crawfordsville) and Hydraulic-Press Brick Co. (Crawfordsville) mined clays for use in heavy clay products. Sand and gravel for road construction and miscellaneous use was produced by Kitts Gravel Co., Harry Petro, Jr., and Lloyd E. Smith (all of Crawfordsville).

**Morgan.**—Adams Clay Products Co. (Martinsville) and Brooklyn Brick Co., Inc., Indiana Drain Tile Co., Inc., and Midwest Aggregates Inc. (all of Brooklyn), mined clays for use in manufacturing heavy clay products and lightweight aggregates. Sand and gravel for building, road construction, and miscellaneous use was produced in the county. Producers reporting were: Perle F. and Bobby Hill and Waverly Sand & Gravel, Martinsville. Waverly Sand & Gravel production came from dredging near Waverly.

**Newton.**—Newton County Stone Co., Inc., at a quarry, crusher, and mill near Kentland, produced crushed limestone for aggregate and agricultural purposes.

**Noble.**—Small quantities of gravel for buildings and roads were reported by Forest Geiger, Ed Tipton, and Furlow Burd. Luther and Haney operated four marl pits.

**Orange.**—A small quantity of whetstones was produced by Indiana Sandstone Co., Inc. (Bedford), from the Hindostan Whetstone quarry near Orleans. French Lick Sandstone Co., Inc. (French Lick), milled dimension sandstone, producing sawed and split stone for architectural use. Limestone for aggregate and agricultural purposes was quarried and crushed by Calcer Quarries, Inc., Paoli; William M. Cave, French Lick; and Radcliff & Berry, Inc., Orleans.

**Owen.**—Fire clay for use in heavy clay products, architectural terra cotta, and other purposes, was mined by Maumee Collieries Co. (Terra Haute) from an open pit near Coal City. Coal was strip-mined by Burcham Bros., Inc., and Maumee Collieries Co. Sand and gravel for building and road construction was produced from dredging by Gosport Gravel Co., Inc. (Gosport). Ingalls Stone Co. (Bedford) quarried dimension limestone at Romona, and Dunn

Digitized by Google

Limestone Co., Inc. (Spencer) quarried and crushed limestone for flux, aggregate, and agricultural purposes.

**Parke.**—Fire and miscellaneous clays for use in heavy clay products were mined by Cayuga Brick & Tile Co., Bloomingdale; and Clay City Pipe Co., Uhrichsville, Ohio. Coal was strip-mined by Gerrard & Presley Coal Co., Maple Grove Mine, and S. L. Turner Coal & Clay Co. Western Indiana Gravel Co. (Lafayette) produced sand and gravel near Montezuma for road construction and railroad ballast. Limestone for concrete aggregate and agricultural purposes was quarried and crushed by Cumberland Quarries, Inc. (Indianapolis) from a site near Wallace.

**Perry.**—Fire and miscellaneous clays were mined for use in manufacturing heavy clay products by Cannelton Sewer Pipe Co. (Cannelton) from an underground mine and by United States Brick Co. (Tell City) from an open-pit mine. Mulzer Bros. (Tell City) quarried and crushed limestone near Derby for aggregate and agricultural purposes.

**Pike.**—Coal mined in the county came from 6 underground mines and 8 strip mines; most of the production resulted from strip-mine operations. Arnold & Willis Coal Co., Meyers Coal Co., Miley Coal Co., Min-Win Coal Co., and R. & H. Coal Co., mined underground and Ayrshire Collieries Corp., Blackfoot Coal & Land Corp., Conder Coal Co., Cornell Excavating, Inc., Davis Excavating Co., and Enos Coal Mining Co., operated strip mines.

**Porter.**—Fire clay was mined and sold by Charles H. Schrock, Chesterton, for use in pottery, stoneware, and refractories. Molding sand was produced near Gary by John N. Bos Sand Co., of Chicago, Ill.; near Miller by Consumers Co., of Chicago, Ill.; and at Dune Park by Portage-Manley Sand Co., of Rockton, Ill. John N. Bos Sand Co. and Consumers Co. also produced building, road, and engine sand. Fire or furnace sand was produced by Crisman Sand Co., Inc. (Gary).

**Posey.**—Sand and gravel for building, road construction, and railroad ballast was produced in the county. Production was reported by Koch Sand & Gravel Co., Evansville; Stoy Huges Gravel Co., Mount Vernon; and New Harmony Sand & Gravel, New Harmony.

**Pulaski.**—Francesville Tile Co. (Francesville) mined clays from an open-pit mine for use in heavy clay products. Carl and James Doty (Monterey) produced sand and gravel for building and road construction. Limestone was quarried, crushed, and milled by Francesville Stone Co., Inc. (Francesville) for aggregate and agricultural purposes.

**Putnam.**—Lone Star Cement Corp. (Indianapolis) produced portland and masonry cement, mined clays, and quarried limestone for use in manufacturing cement at its plant at Limedale. Clark & Sons (Brazil) produced sand and gravel for building, road construction, and miscellaneous use from dredging near Reelsville. Crushed limestone for riprap, aggregate, agricultural and chemical purposes was produced by Cloverdale Stone Co., Cloverdale; Manhattan Crushed Stone Co., Greencastle (quarry at Reelsville); and Russellville Stone Co., Russellville. The Ohio & Indiana Stone Corp. (Toledo, Ohio) operated a quarry and two mills at Greencastle; its output was sold for asphalt roofing, fertilizer, coal-mine rock dust,

Digitized by Google

animal feed, riprap, railroad ballast, metallurgical use, aggregate, and agricultural stone. The Indiana State Farm at Greencastle mined clays for heavy clay products, manufactured agricultural lime, and quarried limestone for aggregate and agricultural purposes. The entire output was used by the Indiana State Farm or other State agencies.

**Randolph.**—Sand and gravel for building, road construction, and miscellaneous use, was produced in the county. Production was reported by Ernest L. Habben, Modoc (near Economy); Hutchens Gravel Co., Lynn; and Marshall Retz, Winchester. H. & R. Stone Co. (Ridgeville) quarried and crushed limestone for aggregate and agricultural purposes.

**Ripley.**—The county highway department produced road sand. Crushed limestone was produced by Cord Stone Co., Versailles; Paul Frank, Inc., North Vernon (quarry near Versailles); Napoleon Quarries, Inc., Napoleon; and Southeastern Materials, Inc., Osgood. Uses were for riprap, aggregate, and agricultural purposes.

**Rush.**—Frank Alexander (Carthage, from a site near Arlington) and W. P. Wolfal Co. (Rushville) produced sand and gravel for building, road construction, and miscellaneous use. Limestone quarried and crushed by McCorkle Stone Co. and Rush County Stone Co. (both of Milroy) was used for riprap, aggregate, and agricultural purposes.

**St. Joseph.**—Production of sand and gravel for building, road construction, and miscellaneous use was reported by Concrete Products Corp., Mishawaka; H. B. Gravel Co., Goshen; Jacob Rose, La Porte; Lincolnway West Gravel Co., C. D. Smelser Co., Inc. (from dredging near Mishawaka), and South Bend Sand & Gravel Corp., all of South Bend; and Western Indiana Gravel Co., Lafayette (from a site near South Bend).

**Scott.**—Scott County Stone Co. (Scottsburg) quarried and crushed limestone for aggregate and agricultural purposes.

**Shelby.**—Sand and gravel for building and road construction was produced by Blue River Packing Co. and Elmer Caldwell, both of Morristown; and E. T. Burnside, Inc., Shelbyville. Cave Stone Co. (Flat Rock, from a site near Norristown) and St. Paul Quarries, Inc. (Indianapolis, from a site near St. Paul) quarried and crushed limestone for use as riprap, flux, aggregate, railroad ballast, and agricultural purposes.

**Spencer.**—Boehmann Bros. and Mulzer Bros. strip-mined coal and St. Meinrad's Arch Abbey mine operated underground. Molding sand was produced by Hardy Sand Co. (Evansville) from a site near Richland.

**Starke.**—Gravel for building and road construction was reported by Al Amidei, North Judson (from a site near Bass Lake); Albert C. Christensen, English Lake (from dredging); Bruce Fletcher, Knox; and the county highway department.

**Steuben.**—Cleveland & Taylor (Fremont) quarried marl for agricultural use. Sand and gravel for building, road construction, and miscellaneous use was produced by Herbert Alleshouse, Pleasant Lake; Angola Sand & Gravel Co. and Stonestreet Gravel Co., Inc., both of Angola; Emery Spade, Orland; and the county highway department.

Digitized by Google

**Sullivan.**—Coal was mined underground by Buck Creek Coal Co., Fairview Collieries Corp., North Wilford Coal Co., and Pandora Coal Co. and from strip mines by Hale Coal Co., Maumee Collieries, S. A. Coal Corp., and Tri State Mining Corp. Engine sand and sand and gravel for building, road construction, railroad ballast, and miscellaneous use were produced in the county. Producers were: The Merom Gravel Co., Indianapolis (from dredging near Merom); and West Carlisle Sand & Gravel, Carlisle.

**Switzerland.**—Limestone for aggregate and agricultural purposes was quarried and crushed by Tri County Stone Co. (Osgood) near Cross Plains.

**Tippecanoe.**—Western Indiana Gravel Co. (Lafayette) produced sand and gravel for road construction and railroad ballast.

**Vanderburgh.**—Standard Brick & Tile Corp. (Evansville) mined clays for use in heavy clay products. Koch Sand & Gravel Co. (Evansville) produced engine sand, road and railroad-ballast gravel, and sand and gravel for building construction. Bedford Nugent Co. processed sand and gravel dredged from the Ohio River.

**Vermillion.**—Production of clays for heavy clay products was reported by Arketex Ceramic Corp., Brazil (from a pit near Dana); and Cayuga Brick Corp., Cayuga. Coal from 3 underground and 2 strip mines was produced by Big Oak Coal Co., Blanford Coal Co., Inc., K. M. & F. Coal Co., Inc., Ayshire Collieries, and Reed Coal Co. Material Service Corp. (Chicago, Ill.) and Standard Materials Corp. (Indianapolis) produced building and road construction sand and gravel from sites near Cayuga and Clinton, respectively, and Nellie Ramsey (Perrysville) produced road gravel.

**Vigo.**—Terre Haute Vitrified Brick Works, Inc. (Terre Haute) mined clays for use in heavy clay products. Mount Pleasant Mining Corp., Oak Grove Coal Co., Snow Hill Coal Corp., Tri-K Mining Co., and Viking Coal Corp. mined coal underground, and Frazier Coal Co., Lone Star Coal Co., and Maumee Collieries Co. strip-mined coal. Sand and gravel for building, road construction, and miscellaneous use was produced in the county. Producers were: Standard Materials Corp., Indianapolis; and G. A. Monninger, Quinn Gravel Co. (near Prairie Creek), and Wabash Sand & Gravel Co., Inc. (from dredging), all of Terre Haute.

**Wabash.**—Gravel for building, road construction, and miscellaneous use was produced by Hubert Baker and Floyd Dyson, both of Wabash; Frank & Miller Gravel & Ready Mix Co., Somerset; D. R. Keim, Roann; Earnest Lines, La Fontaine; and the county highway department. The county highway department also contracted for road sand.

**Warren.**—Neal Gravel Co. (Covington) produced gravel in Mound Township.

**Warrick.**—Warrick was the leading coal-producing county in the State. Output came from 10 underground and 10 strip mines. Producers were Boone Coal Co., Decker Coal Co., Houston Mining Co., Ingle Coal Corp., Polk Patch Mining Co., Inc., Reed Mining Co., Rose Mining Co., Inc., Rudolph Coal & Oil Co., Shaw Mining Co., and Simpson Mining Co. (all from underground mines), and A. B. C. Coal Corp., Booneville Collieries Corp., E. W. Kennedy Coal Corp., Lynnville Coal Co., Ezra Nixon Coal Co., Peabody Coal Co., Scales Coal Corp., Tecumseh Coal Corp., and Victoria Coal Corp. (all from strip

Digitized by Google

mines). Lemmons & Co., Inc. (Lynnville) quarried and crushed limestone for aggregate and agricultural purposes. A small quantity of road gravel also was produced in the county.

**Wayne.**—Production of sand and gravel for building, road construction, railroad ballast, and miscellaneous use was reported by American Aggregates Corp., Greenville, Ohio (from a site near Richmond); De Bolt Concrete Co., Inc., Richmond; Fisher Gravel Co., Hagerstown; and Kirkpatrick Gravel Co., Inc., Cambridge City. Building and road gravel was produced by and for the county highway department. De Bolt Concrete Co., Inc., also quarried and crushed limestone for riprap, aggregate, and agricultural purposes.

**Wells.**—Moss peat was produced by Ballards Peat Moss, Warren (from a bog near Jackson); and humus peat was produced by William Graves, Montpelier (from a bog near Warren). Building and road gravel was produced by Irvin Gravel & Supply (Bluffton). The Erie Stone Co. (Toledo, Ohio) quarried limestone near Bluffton for flux, and Heller Stone Co. (Bluffton) quarried dimension limestone for flagging; output of both companies was used for aggregate and agricultural purposes.

**White.**—Limestone for aggregate, railroad ballast, and agricultural purposes, was quarried and crushed by Monon Crushed Stone Co., Inc. (Monon).

**Whitley.**—Elmer A. Lauer (Columbia City) produced road gravel by dredging, and Allen-Whitley County Gravel Co. produced sand and gravel for building and road construction and miscellaneous uses.

Digitized by Google

Digitized by Google

# The Mineral Industry of Iowa

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Iowa.

By Samuel A. Gustavson [1]

THE VALUE of minerals produced in Iowa was about $66.5 million in 1956, a 5-percent increase over 1955. Although not usually thought a mining State, Iowa ranked 4th in the United States in production of gypsum and 10th in production of cement. In order of value, minerals produced in the State in 1956 were: Portland cement, stone, sand and gravel, coal, gypsum, masonry cement, peat, and lime. No metallic minerals were produced in Iowa in 1956.

**TABLE 1.—Mineral production in Iowa, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | (2) | (2) | [3] 852,020 | [3] $1,077,642 |
| Cement: | | | | |
| Portland ..... 376-pound barrels | 9,914,977 | $27,837,413 | 10,333,425 | 31,158,508 |
| Masonry ..... do | 514,966 | 1,701,574 | 426,765 | 1,664,181 |
| Coal [4] | 1,258,357 | 4,401,857 | 1,358,250 | 4,731,969 |
| Gypsum (crude) | 1,337,160 | 4,176,710 | 1,177,488 | 3,919,032 |
| Peat | (3) | (3) | 27,375 | (3) |
| Sand and gravel | 11,770,836 | 8,344,832 | 12,895,253 | 9,524,685 |
| Stone | 15,705,412 | 18,555,176 | 14,034,841 | 17,256,566 |
| Value of items that cannot be disclosed: Fire clay (1956), lime, peat, and values indicated by footnote 2 | ---------- | 1,252,282 | ---------- | 467,382 |
| Total Iowa [5] | ---------- | 63,555,000 | ---------- | 66,529,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing company confidential data.
[3] Incomplete figure; fire clay included with "Value of items that cannot be disclosed."
[4] Relates only to mines with a production of 1,000 tons or more.
[5] The total has been adjusted to avoid duplication in the value of clays and stone used in the production of cement and lime.

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Cement.**—Portland and masonry cements were produced at 5 plants, of which 2 were in Cerro Gordo County, 2 in Polk County, and 1 in Scott County. Types I and II, general-use and moderate-heat, were produced at all 5 plants; type III, high-early-strength, was produced at 4 plants; air-entrained cement was produced at all 5 plants; and masonry cements were produced from portland cement at 2 plants. Shipments of portland cement increased in 1956, paralleling the increase in

[1] Chief, Minneapolis Field Office, Division of Mineral Industries, Region V, Bureau of Mines, Minneapolis, Minn.



Digitized by Google

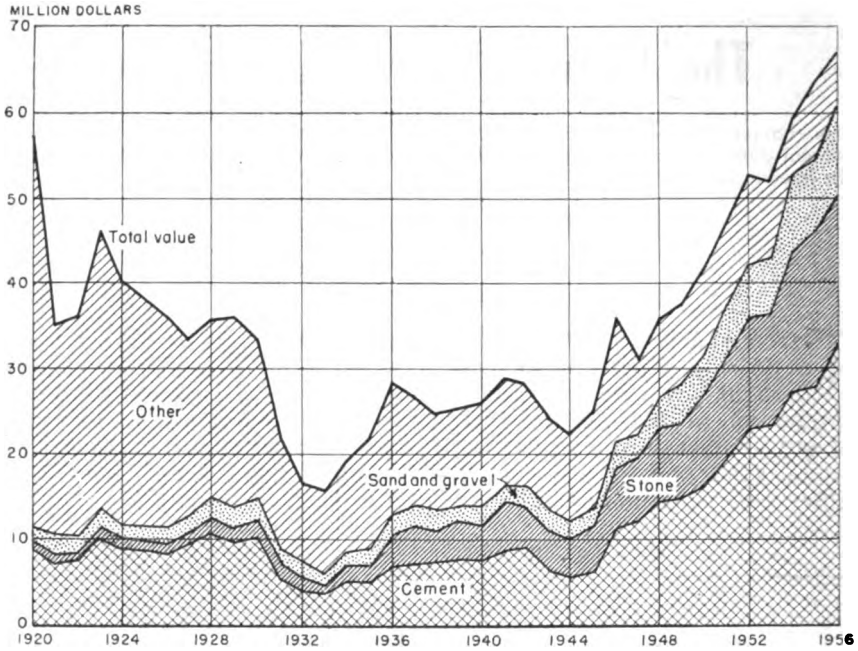



FIGURE 1.—Value of cement, stone, sand and gravel, and total value of mineral production in Iowa, 1920–56.

highway paving, whereas shipments of masonry cement declined. The average value of portland cement was $3.02 per barrel in 1956 and $2.81 in 1955, and the average value of masonry cement was $3.90 per barrel in 1956 and $3.30 in 1955.

The 5 operating companies consumed 231 million kw.-hr. of electricity, of which 47 percent was generated at company plants and 53 percent purchased. The 25 operating kilns ranged in size from 110 feet in length by 7 feet in diameter to 465 feet in length by 11 feet 6 inches in diameter. Most of the cement produced in Iowa was sold for use in Iowa and Minnesota. Substantial shipments also were made to Illinois and Wisconsin and smaller shipments to Indiana, Kansas, Michigan, Nebraska, North Dakota, and South Dakota.

**Clays.**—Clays produced in Iowa were used primarily in manufacturing cement and heavy clay products, such as drain tile and common brick. Clay classed as fire clay was produced for use in manufacturing refractories. The increased demand for cement caused an increase in the output of clay for use in cement; however, local decreases in demand for other construction materials and drain tile caused a decrease in the output of clay for use in manufacturing brick, sewer tile, and related products. Production was reported from pits in 15 Iowa counties.

**Gypsum.**—Production of gypsum followed the decrease in building and housing and was about 12 percent less in 1956 than in 1955. The gypsum industry of Iowa was concentrated in Webster County. Four companies operated mines in 1956, of which 3 also manufactured gypsum board. The fourth company announced plans for construct-

Digitized by Google

ing a board plant, expecting completion in 1957. Products included premixed perlite plasters, gypsum lath, wallboard, sheathing, and other preformed gypsum products. Calcined gypsum was sold in bulk for use in cement and plasters. Small quantities of gypsum were used in the glass and pottery industries; for art molding and casting; and in dental and orthopedic plaster.

**Lime.**—Quick lime and hydrated lime were produced in Scott County by Linwood Stone Products Co., Inc. Most of the quicklime was sold for metallurgical use. Hydrated lime was used principally for building and water purification. Small quantities were used for manufacturing calcium carbide, as a filler in insecticides, and as a filter in petroleum refining. Sales increased over 1955.

**Perlite.**—Crude perlite was expanded by 1 company in Polk County and 2 in Webster County. In Webster County perlite-expanding plants were operated in conjunction with gypsum plants, where the expanded perlite was used in manufacturing premixed lightweight plaster. Much of the material produced in Polk County was also used in lightweight plasters. Production and sales were slightly below 1955. The crude perlite was mined in Colorado.

**Sand and Gravel.**—Sand and gravel operations were reported in 69 Iowa counties in 1956. Tonnage output increased nearly 10 percent over 1955. Most of this increase was due to expansion in highway construction, as building and housing projects decreased. A relatively small tonnage of sand and gravel was sold for industrial uses and railroad ballast. The bulk of the output was used in the building industries and for road construction.

In 1956, 113 commercial producers reported output. Of these, the 10 leading companies accounted for 38 percent of the value of production in the State. The 10 leading producers were:

Acme Fuel & Material Co., Muscatine.
Beu & Sons Co., Grundy Center.
Concrete Materials Co., Waterloo.
Coon Valley Gravel Co., Des Moines.
Estherville Sand & Gravel Co., Estherville.
L. G. Everist, Inc., Sioux Falls, S. Dak.
Hallett Construction Co., Crosby, Minn.
Maudlin Construction Co., Webster City.
Pound Construction Co., Scranton.
Vanden Brink Bros., Dallas Center.

In Iowa, as in other States, a trend toward improving the quality of sand and gravel was noticeable in 1956. Sand and gravel was upgraded by gravity separation to eliminate objectionable material, such as bits of wood, coal particles, and sometimes soft or reactive materials. Some sand and gravel was upgraded by careful screening and elimination of certain sizes. More attention was given to controlling sizes of particles and percentages of sizes, particularly in sand. The need for upgrading sand and gravel, resulted primarily from more rigid specifications for concrete aggregate.

An index of aggregate resources was compiled by the Iowa State Highway Commission. The index summarizes data in the files of the Iowa Highway Commission and saves duplication of effort in locating and evaluating these data. The index should prove a valuable aid to contractors and material producers in locating deposits of the type of material desired. Further information on the index may be obtained from the Iowa State Highway Commission, Ames, Iowa.

465877—58——29

Digitized by Google

**TABLE 2.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 2,428,972 | $1,915,831 | $0.79 | 2,514,501 | $2,049,568 | $0.82 |
| Engine | 12,800 | 11,760 | .92 | 37,828 | 48,737 | 1.29 |
| Paving [1] | 1,087,379 | 829,948 | .76 | 1,734,050 | 1,193,696 | .69 |
| Railroad ballast | 26,434 | 10,682 | .40 | 22,300 | 4,000 | .18 |
| Other | 147,688 | 85,844 | .58 | 89,691 | 49,043 | .55 |
| Undistributed [2] | 210,778 | 355,418 | ------ | 128,279 | 337,958 | ------ |
| Total | 3,914,051 | 3,209,483 | .82 | 4,526,649 | 3,683,002 | .81 |
| Gravel: | | | | | | |
| Building | 1,190,092 | 1,652,695 | 1.39 | 1,372,847 | 1,882,572 | 1.37 |
| Paving [1] | 3,171,202 | 2,246,724 | .71 | 3,793,191 | 2,652,141 | .70 |
| Railroad ballast | 70,492 | 39,642 | .56 | 35,876 | 15,139 | .42 |
| Other | 40,135 | 24,159 | .60 | 86,387 | 122,017 | 1.41 |
| Total | 4,471,921 | 3,963,220 | .89 | 5,288,301 | 4,671,869 | .88 |
| Total sand and gravel | 8,385,972 | 7,172,703 | .86 | 9,814,950 | 8,354,871 | .85 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: Paving [1] | 598,077 | 217,924 | .36 | 172,966 | 51,951 | .30 |
| Gravel: Paving [1] | 2,786,787 | 954,205 | .34 | 2,907,337 | 1,117,863 | .38 |
| Total sand and gravel | 3,384,864 | 1,172,129 | .35 | 3,080,303 | 1,169,814 | .38 |
| ALL OPERATIONS | | | | | | |
| Sand | 4,512,128 | 3,427,407 | .76 | 4,699,615 | 3,734,953 | .79 |
| Gravel | 7,258,708 | 4,917,425 | .68 | 8,195,638 | 5,789,732 | .71 |
| Grand total | 11,770,836 | 8,344,832 | .71 | 12,895,253 | 9,524,685 | .74 |

[1] Includes materials used in bridges, culverts, etc.
[2] Value of items that cannot be disclosed: Molding, blast, and filter sand (1955–56).

**TABLE 3.—Limestone sold and used by producers, 1955–56, by uses**

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average |
| Commercial: | | | | | | |
| Agriculture | 1,399,844 | $1,988,306 | $1.42 | 1,563,775 | $2,153,714 | $1.38 |
| Dimension | 903 | 1,255 | 1.39 | 10,023 | 25,683 | 2.56 |
| Fluxing stone | (1) | (1) | ------ | 47,505 | 67,493 | 1.42 |
| Railroad ballast | (1) | (1) | ------ | 39,055 | 55,082 | 1.41 |
| Riprap | 588,371 | 707,739 | 1.20 | 455,079 | 505,098 | 1.11 |
| Concrete aggregate, roadstone, etc. | 9,841,582 | 11,773,423 | 1.20 | 9,034,207 | 11,192,519 | 1.24 |
| Other [2] | 2,861,205 | 3,093,754 | 1.08 | 2,207,732 | 2,651,563 | 1.20 |
| Total | 14,691,905 | 17,564,477 | 1.20 | 13,357,376 | 16,651,152 | 1.25 |
| Noncommercial, all uses (concrete aggregate, roadstone, riprap) | 1,013,507 | 990,699 | .98 | 677,465 | 605,414 | .89 |
| Total commercial and noncommercial | 15,705,412 | 18,555,176 | 1.18 | 14,034,841 | 17,256,566 | 1.23 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."
[2] Includes limestone for cement and lime, and data indicated by footnote 1

Digitized by Google

**Stone.**—Limestone production was reported from 57 Iowa counties in 1956. About 64 percent of the output was crushed for concrete aggregate, roadstone, and agricultural stone; the remainder was used chiefly for manufacturing cement and lime and for various chemical and industrial uses.

The tonnage of limestone produced in 1956 was nearly 10 percent less than in 1955. Unit value was slightly higher, averaging $1.23 a ton in 1956 compared with $1.18 in 1955. The decline in output was due partly to use of less limestone for secondary roads of the State; also, although more cement was manufactured, less limestone was produced for this use, the requirement differences being met from stocks. Use of crushed limestone as a concrete aggregate also decreased. Consumption of limestone for minor uses increased or remained about the same. Minor uses include: Agricultural lime, filler, and metallurgical flux. The 10 leading commercial producers, who supplied 41 percent of the limestone reported in 1956, were:

Beu & Sons Co., Grundy Center.
Concrete Materials & Construction Co., Cedar Rapids.
Kaser Construction Co., Des Moines.
Lehigh Portland Cement Co., Allentown, Pa.
Linwood Stone Products Co., Inc., Buffalo.
Marquette Cement Mfg. Co., Chicago, Ill.
Missouri Valley Limestone Co., Oakland.
Northwestern State Portland Cement Co., Mason City.
Penn-Dixie Cement Corp., Nazareth, Pa.
E. I. Sargent Quarries, Inc., Des Moines.

## MINERAL FUELS

**Coal.**—Bituminous-coal production was reported from 10 counties in 1956; 31 strip and 33 underground mines were in operation. Virtually all of the coal produced was consumed in Iowa, chiefly for generating electric power and for heating State, county, and municipally owned buildings or institutions; a relatively small part was used for heating homes and business establishments. The increased production in 1956 reflected the increased demand for electric power.

**TABLE 4.—Bituminous coal production, value, and number of mines operated in 1956, by counties**

(Exclusive of mines producing less than 1,000 net tons)

| County | Production (net tons) | | | Value | | Number of mines operated | | |
|---|---|---|---|---|---|---|---|---|
| | Underground | Strip | Total | Average per ton | Total | Underground | Strip | Total |
| Appanoose | 95,635 | 13,671 | 109,306 | $4.78 | $522,834 | 13 | 1 | 14 |
| Davis | 5,333 | 48,959 | 54,292 | 3.36 | 182,603 | 1 | 2 | 3 |
| Mahaska | 3,000 | 142,144 | 145,144 | 3.44 | 498,604 | 1 | 9 | 10 |
| Marion | 95,815 | 684,673 | 780,488 | 3.25 | 2,540,412 | 9 | 9 | 18 |
| Monroe | 59,224 | 63,425 | 122,649 | 3.30 | 404,617 | 6 | 3 | 9 |
| Polk | ---------- | 9,886 | 9,886 | 3.50 | 34,601 | ---------- | 1 | 1 |
| Van Buren | ---------- | 25,971 | 25,971 | 5.12 | 133,030 | ---------- | 2 | 2 |
| Wapello | 6,498 | 95,800 | 102,298 | 3.74 | 382,382 | 1 | 4 | 5 |
| Other counties [1] | 8,216 | ---------- | 8,216 | 4.00 | 32,886 | 2 | ---------- | 2 |
| Total | 273,721 | 1,084,529 | 1,358,250 | 3.48 | 4,731,969 | 33 | 31 | 64 |

[1] Lucas and Warren Counties.

**Peat.**—Moss peat, reed or sedge peat, and humus were produced in Worth County. Production was about one-third greater than in 1955. This increase can be attributed to wider distribution and improved marketing. The product of the two producers in Iowa was sold in bulk and packaged in small bags for home use, either as peat or mixed with soil and fertilizers.

Digitized by Google

## REVIEW BY COUNTIES

**Adair.**—Crushed limestone for agricultural use and concrete aggregate was sold by K. H. Buttler, Guthrie Center; and E. F. Schildberg, Greenfield.

**Adams.**—Missouri Valley Limestone Co. (Oakland) quarried limestone for use as concrete aggregate.

**Allamakee.**—Sand and gravel for building and road construction was produced by Carlson Materials Co., Inc. (Decorah), and Francis Schwartzhoff (Dorchester).

Sales of limestone for agricultural stone and concrete aggregate were reported by Andrew Bresnahan and R. J. Cooney Construction Co., Waukon; H. L. Leas, Monona; Joe F. Pavlovec, Calmar; and Roverud Construction Co., Spring Grove, Minn.

**Appanoose.**—Clays, bituminous coal, and limestone were produced in the county.

Iowa Clay Products Co. (Centerville) produced miscellaneous clay for manufacturing heavy clay products.

Bituminous coal was mined at 13 underground mines and 1 strip mine. Underground mines were operated by Appanoose Coal Co., Clarke Coal Co., D. C. Coal Co., K–K Coal Co., Long Branch Coal Co., Monitor Coal Co., New Block Coal Co., New Gladstone Coal Co., Old King Coal Co., Riverside Coal Co., Shamrock Coal Co., and Sunshine Coal Co. (2 mines). The Titomic Mining Corp. operated a strip mine.

**TABLE 5.—Value of mineral production in Iowa, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adair | (2) | (2) | Stone. |
| Adams | $207,909 | $102,240 | Do. |
| Allamakee | 149,952 | 127,807 | Stone, sand and gravel. |
| Appanoose | 892,313 | 907,414 | Coal, stone, clays. |
| Audubon | 25,279 | ---------- | |
| Benton | 112,075 | 201,817 | Stone, sand and gravel, clays. |
| Black Hawk | 1,050,445 | 1,174,353 | Stone, sand and gravel. |
| Boone | 216,185 | 255,971 | Sand and gravel. |
| Bremer | (2) | (2) | Stone. |
| Buchanan | 164,741 | 186,385 | Stone, sand and gravel. |
| Buena Vista | 196,379 | 65,039 | Sand and gravel. |
| Butler | 95,327 | 178,182 | Stone, sand and gravel. |
| Calhoun | 31,190 | 354,613 | Sand and gravel. |
| Carroll | 92,573 | 102,564 | Do. |
| Cass | 312,447 | 64,255 | Stone. |
| Cedar | 318,147 | 176,121 | Do. |
| Cerro Gordo | 13,627,113 | 15,459,373 | Cement, stone, sand and gravel, clays. |
| Cherokee | 92,914 | 111,247 | Sand and gravel. |
| Chickasaw | 141,364 | (2) | Stone. |
| Clarke | ---------- | 15,654 | Do. |
| Clay | 105,364 | 178,215 | Sand and gravel. |
| Clayton | (2) | (2) | Sand and gravel, stone. |
| Clinton | 109,320 | 88,200 | Sand and gravel. |
| Crawford | 83,196 | 111,965 | Do. |
| Dallas | 255,348 | 216,973 | Clays, sand and gravel. |
| Davis | 285,475 | 182,603 | Coal. |
| Decatur | (2) | 248,594 | Stone. |
| Delaware | 177,634 | 310,560 | Stone, sand and gravel. |
| Des Moines | 249,420 | 265,615 | Do. |
| Dickinson | (2) | (2) | Sand and gravel. |
| Dubuque | (2) | 501,230 | Stone, sand and gravel. |
| Emmet | 163,419 | 178,297 | Sand and gravel. |
| Fayette | 258,376 | 472,194 | Stone, sand and gravel. |
| Floyd | 287,541 | 146,814 | Stone, clays, sand and gravel. |
| Franklin | 150,512 | 421,891 | Sand and gravel, clays, stone. |
| Fremont | (2) | (2) | Stone. |
| Greene | 254,380 | 121,854 | Sand and gravel. |
| Grundy | 75,794 | 66,170 | Sand and gravel, stone. |
| Guthrie | (2) | (2) | Sand and gravel. |
| Hamilton | 23,690 | 42,492 | Do. |
| Hancock | 112,562 | 156,684 | Do. |

See footnotes at end of table.

Digitized by Google

**TABLE 5.—Value of mineral production in Iowa, 1955–56, by counties [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Hardin | $826,992 | $924,556 | Stone, sand and gravel. |
| Harrison | 268,677 | 378,091 | Do. |
| Henry | 180,666 | 205,178 | Sand and gravel, clays. |
| Howard | 47,270 | 91,970 | Stone, sand and gravel. |
| Humboldt | 259,406 | 499,780 | Do. |
| Jackson | 144,607 | (2) | Do. |
| Jasper | 117,263 | 187,418 | Do. |
| Jefferson | 36,840 | 85,000 | Stone. |
| Johnson | (2) | (2) | Stone, sand and gravel. |
| Jones | 57,024 | 63,500 | Sand and gravel, stone. |
| Keokuk | (2) | (2) | Stone, clays. |
| Kossuth | 221,228 | 169,320 | Sand and gravel. |
| Lee | 247,002 | 469,983 | Stone, sand and gravel. |
| Linn | 733,337 | 755,845 | Do. |
| Louisa | (2) | 254,866 | Do. |
| Lucas | | (2) | Coal. |
| Lyon | 81,756 | 134,268 | Sand and gravel. |
| Madison | 308,964 | 931,658 | Stone, sand and gravel. |
| Mahaska | 767,179 | 958,280 | Coal, stone, sand and gravel, clays. |
| Marion | 2,737,960 | 3,080,498 | Coal, stone, sand and gravel. |
| Marshall | 483,914 | (2) | Stone, sand and gravel. |
| Mills | | 204,734 | Stone. |
| Mitchell | 240,412 | 232,323 | Stone, sand and gravel. |
| Monona | 3,038 | 23,773 | Sand and gravel. |
| Monroe | 322,659 | 451,715 | Coal, stone. |
| Montgomery | 328,608 | 246,479 | Stone. |
| Muscatine | 407,579 | 655,405 | Sand and gravel, stone. |
| O'Brien | (2) | 50,519 | Sand and gravel. |
| Osceola | 98,914 | 154,596 | Do. |
| Palo Alto | 37,899 | 83,791 | Do. |
| Plymouth | 83,270 | 248,721 | Do. |
| Pocahontas | (2) | (2) | Stone, sand and gravel. |
| Polk | 10,368,715 | 12,234,309 | Cement, sand and gravel, stone, clays, coal. |
| Pottawattamie | 645,195 | | |
| Sac | 251,171 | | |
| Scott | 8,751,246 | 10,110,376 | Cement, stone, lime, clays, sand and gravel. |
| Shelby | 343,416 | 480,785 | Sand and gravel. |
| Story | 228,450 | 362,000 | Stone, sand and gravel, clays. |
| Tama | (2) | (2) | Stone, sand and gravel. |
| Taylor | 72,203 | | |
| Union | | 98,799 | Stone, sand and gravel. |
| Van Buren | 364,844 | 354,270 | Stone, coal, sand and gravel. |
| Wapello | 652,639 | 788,119 | Coal, stone, sand and gravel, clays. |
| Warren | 32,370 | 59,943 | Clays, coal. |
| Washington | 331,790 | (2) | Stone. |
| Webster | 4,594,405 | 4,291,346 | Gypsum, clays, stone, sand and gravel. |
| Winnebago | 79,516 | 96,006 | Sand and gravel. |
| Winneshiek | 207,317 | 292,874 | Stone, sand and gravel. |
| Woodbury | (2) | 267,404 | Sand and gravel. |
| Worth | 453,049 | 324,350 | Peat, stone, sand and gravel. |
| Wright | 85,614 | 89,977 | Sand and gravel. |
| Undistributed | 6,732,257 | 5,213,754 | |
| Total [3] | 63,555,000 | 66,529,000 | |

[1] The following counties are not listed because no production was reported: Ida, Iowa, Page, Poweshiek, Ringgold, Shelby, and Wayne.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] The 1956 total has been adjusted to avoid duplication in the value of clays and stone used in the production of cement and lime.

Limestone for agricultural stone and concrete aggregate was quarried by W. P. Farnsworth, L. & W. Construction Co., Inc., and Porter & Magnall Construction Co., all of Centerville.

**Benton.**—Clays, sand and gravel, and stone were produced in the county.

Production of clays for manufacturing heavy clay products was reported by Garrison Brick & Tile Works, Garrison.

Beu & Sons Co. (Grundy Center) operated the Vinton and Zeinie Pits and produced gravel for road construction.

Crushed limestone for agricultural stone, concrete aggregate, and riprap was produced by B. L. Anderson, Inc., Cedar Rapids; W. E. Dake, Garrison; and Vinton Lime & Rock Co., Vinton.

Digitized by Google

**Black Hawk.**—Sand and gravel and stone valued at more than $1 million were produced in Black Hawk County. Output of sand and gravel for building and road construction was reported by Bernard Assink (at Cedar Falls), Concrete Materials Co. (at Waterloo), and Larsen Construction Co., all of Cedar Falls; Jay B. Bagenstos & Son., La Porte City; Beu & Sons Co., Grundy Center (operating the Bochaus, Burk Siding, and Matthais pits); and Hanson & Son Sand & Gravel Co., C. W. Shirey Co., and Waterloo Dredging Co., all of Waterloo.

Beu Limestone Co. (Waterloo) operated the Newton Quarry; Beu & Sons Co. (Grundy Center) the Yokom Quarry; Concrete Materials & Construction Co. (Cedar Rapids) a quarry near Waterloo; and Pint Soft Lime Products Co. (Raymond) quarries in the county. Limestone was crushed for agricultural stone, blast-furnace flux, concrete aggregate, and fertilizer filler.

**Boone.**—Sand and gravel for building and road construction was produced in the county by Hallett Construction Co., Crosby, Minn., operating the Boone Plant (Mondt and Rutherford Pits); J. W. Lehman, Sheldahl; Dan Leininger, Boone; and I. B. Welder, Madrid.

**Bremer.**—Beu & Sons Co. (Grundy Center) operated the Denver and Fredericka limestone quarries. Paul Niemann Construction Co. (Sumner) and Schield Soft Lime Quarry (Waverly) produced crushed limestone for concrete aggregate and agricultural stone.

**Buchanan.**—Sales of road-construction gravel were reported by Beu & Sons Co. (Grundy Center) from the Winthrop pit.

Production of limestone for agricultural stone and concrete aggregate was reported by Beu & Sons Co. (Grundy Center) operating the Edgerton Quarry; Hewitt Bros., Fredericksburg; Light Construction Co., Manchester; Paul Niemann Construction Co., Sumner; and E. F. Patton Co., Independence.

**Buena Vista.**—Paving gravel was produced by the highway departments of Buena Vista and Winnebago Counties. The highway departments of Clay and Winnebago Counties contracted for paving gravel.

**Butler.**—Sand and gravel and stone were produced in Butler County. Sales of sand and gravel for building, road construction, and miscellaneous uses were reported by Beu & Sons Co. (Grundy Center), operating the Brooks, Greene, and Hurd pits; Meyer & Muller and Charles Willeke & Sons, Aplington; and Waverly Gravel & Tile Co., Shell Rock. Crushed limestone for agricultural stone and concrete aggregate was produced by Greene Limestone Co., Greene; Neymeyer Limestone Co., Aplington; Shell Rock Lime Co., Inc., Shell Rock; and Willman Construction, Cedar Rapids.

**Calhoun.**—Output of sand and gravel for building and road construction was reported by Hallett Construction Co., Crosby, Minn., at Lake View. The County highway department produced and contracted for paving gravel.

**Carroll.**—Carroll Sand & Gravel Co. (Carroll), Leo H. Korwes (Carroll near Maple River), McClue Gravel Co. (Lanesboro), and Robert H. Walters (Glidden) produced sand and gravel for building and road construction. The county highway department contracted for paving sand.

**Cass.**—Crushed stone for concrete aggregate was produced by the Missouri Valley Limestone Co. (Oakland).

Digitized by Google

**Cedar.**—Limestone was produced for asphalt filler, agricultural stone, concrete aggregate, and riprap by C. B. Dewees Construction Co., Marion; Light Construction Co., Manchester; Perry Construction Co., Cedar Rapids; and Robinson Bros., Tipton.

**Cerro Gordo.**—Cement, clays, sand and gravel, and stone were produced in the county.

Lehigh Portland Cement Co. and Northwestern States Portland Cement Co., operating plants at Mason City, produced masonry and portland cement. Clays and limestone for use in the manufacture of cement were produced locally. The Lehigh Portland Cement Co. operated 6 kilns, each 140 feet in length and 9 feet, 6 inches in diameter at the upper end and 9 feet in diameter at the lower end. The plant was idle 51 days because of a labor strike. Northwestern States Portland Cement Co. operated 10 kilns ranging in size from 110 feet in length and 7 feet in diameter to 165 feet in length and 11 feet in diameter. One of the larger kilns was installed and placed in operation in 1956.

Mason City Brick & Tile Co. (Mason City) mined clay for manufacturing brick and tile.

Sand and gravel for building, road construction, railroad ballast, and miscellaneous uses was produced by Clear Lake Sand & Gravel Co., Inc., Clear Lake; Ideal Sand & Gravel Co., Mason City; and Maudlin Construction Co., Webster City.

Limestone for use in cement and crushed stone for agricultural stone, concrete aggregate, and fertilizer were produced by Fertile Limestone Co., Fertile; Greene Limestone Co., Greene; Grupp Construction Co., Riceville; and Ideal Sand & Gravel Co., Mason City.

**Cherokee.**—Road-construction gravel was produced by Maudlin Construction Co., Webster City. Shea Sand & Gravel Co. (Cherokee) produced sand and gravel for building, road construction, and miscellaneous uses.

**Chickasaw.**—Crushed limestone for concrete aggregate was produced by the Bouska Construction Co., Protivin. Beu & Sons Co. (Grundy Center), operating the Chickasaw and Erwine Quarries, produced limestone for agricultural stone and concrete aggregate.

**Clarke.**—Limestone was produced by E. I. Sargent Quarries, Inc. (Des Moines), for use as concrete aggregate.

**Clay.**—Maudlin Construction Co. (Webster City) and Stolley Sand & Gravel Co. (Spencer) produced sand and gravel for building, road construction, and miscellaneous uses. The county highway department contracted for paving gravel.

**Clayton.**—Concrete Materials Co. (Cedar Rapids) operating near Clayton, produced building and molding sand. H. L. Leas (Monona) quarried limestone for concrete aggregate and agricultural stone.

**Clinton.**—Sand and gravel output was reported by Hass Gravel Pit, Clinton, near Camanche; Fred R. McKenzie & Co., Galesburg, near Clinton; and Weaver Construction Co., Iowa Falls, operating the Wheatland Pit. Products were engine sand and concrete aggregate.

**Crawford.**—L. J. Adams (Denison), James Ballantine (Arion), and Mauer Construction Co. (Sac City) produced sand and gravel for building, road construction, and miscellaneous uses. The county engineer, Crawford, produced and contracted for paving gravel.

Digitized by Google

**Dallas.**—Clay pits were operated near Adel by Adel Clay Products Co., West Des Moines; Redfield Brick & Tile Co., Redfield; and United Brick & Tile Co., Kansas City, Mo. The output was used for manufacturing heavy clay products.

Sand and gravel, chiefly for building and road construction, was produced by Booneville Gravel Co., Booneville; Breeden Sand & Gravel Co., Des Moines; Concrete Materials Co., Cedar Rapids, operating near Booneville; and Perry Sand & Gravel Co., Perry.

**Davis.**—Bituminous coal was produced from strip mines by Continental Mining Corp. and Davis County Coal Co. Shute & Lewis Coal Co. operated an underground mine.

**Decatur.**—Output of crushed limestone for agricultural stone and concrete aggregate was credited to Grand River Limestone Co., Grand River; E. I. Sargent Quarries, Inc., Des Moines; and Twin State Quarries, Inc., Allerton.

**Delaware.**—Beu & Sons Co., Grundy Center, operating the Henderson Pit, and Dyersville Sand & Gravel, Dyersville, produced sand and gravel for building and road construction.

Limestone was produced by Beu & Sons Co., operating the Walston Quarry; Weber Dehn and Light Construction Co., both of Manchester; Dyersville Sand & Gravel, Dyersville; Kuhlman Construction Co., Colesburg; and Madlom Brothers, Edgewood. The output was used for concrete aggregate and agricultural stone.

**Des Moines.**—Spring Sand & Gravel Co. (Davenport) produced sand and gravel for building and road construction.

J. T. Leonhard (Columbus Junction), operating near Mediapolis, produced crushed stone for concrete aggregate and agricultural stone. Rough dimension stone and crushed stone for agricultural stone, concrete aggregate, and riprap was produced by Raid Brothers Construction Co. (Burlington), at the Charbonneaux and Mediapolis Quarries.

**Dickinson.**—Concrete Sand & Materials Co. (Milford) produced sand and gravel for building and road construction.

**Dubuque.**—Dubuque Sand & Gravel Co. and Molo Sand & Gravel Co. (Dubuque) produced building sand and gravel.

Limestone quarries were operated by Dubuque Stone Products Co., Dubuque; Light Construction Co., Manchester; and the county highway department. The stone was crushed for use as concrete aggregate.

**Emmet.**—Don Billings Sand & Gravel Co. and Estherville Sand & Gravel Co. (both of Estherville) and Hoien Gravel Pit (Armstrong), produced sand and gravel for building, road construction, and miscellaneous uses. Gravel for railroad ballast was produced by the Chicago, Rock Island & Pacific Railroad Co. The county highway department produced and contracted for paving gravel.

**Fayette.**—Sand and gravel operations in the county were reported by Oelwein Sand & Gravel Co., Oelwein; Riesner Sand & Gravel Co., Sumner; and Carl Zupke & Son Sand & Gravel, Randalia. The output was used for building and road construction.

Limestone was quarried by Fayette Stone Co. (Fayette), Hewitt Brothers (Fredericksburg), Paul Niemann Construction Co. (Sumner), and the county highway department for use as agricultural stone, concrete aggregate, and riprap.

**Floyd.**—Rockford Brick & Tile Co. (Rockford) operated a clay pit and produced miscellaneous clay for use in heavy clay products.

Digitized by Google

Limestone for agricultural stone and concrete aggregate was quarried by Walter Beine, Charles City, and Heckman-Reynolds, Inc. (Floyd). The county highway department contracted for paving gravel.

**Franklin.**—Sheffield Brick & Tile Co. (Sheffield) produced clay for use in heavy clay products.

Sand and gravel pits were operated by Vanden Brink Brothers, Dallas Center; Hallett Construction Co., Crosby, Minn., operating near Geneva; Maudlin Construction Co., Webster City; and Louis C. Toft, Dows. The output was used for building, road construction, and miscellaneous purposes. The county engineer reported production and contracts for paving gravel.

Limestone was produced by R. W. Phillips (Hampton), and Rieken Limestone Co. (Ackley) at the Humke Quarry, for agricultural stone and concrete aggregate.

**Fremont.**—Fred Wenke (Thurman), and the county highway department produced limestone for concrete aggregate.

**Greene.**—Building and road-construction sand and gravel was produced by Ferguson-Diehl Construction Co. (Jefferson). The Minneapolis & St. Louis Railway produced railroad-ballast gravel.

**Grundy.**—Ben Ankes (Wellsburg) produced sand for road construction. The county highway department contracted for paving gravel. Beu & Sons Co. (Grundy Center) operated the Rieken Quarry and produced limestone for agricultural stone and concrete aggregate.

**Guthrie.**—K. H. Buttler (Guthrie Center) produced road-construction gravel.

**Hamilton.**—Maudlin Construction Co. (Webster City) produced gravel for road construction. The county highway department contracted for paving gravel.

**Hancock.**—Sand and gravel was produced by Sankey Sand & Gravel (Britt) for building and road construction. The county highway department contracted for paving gravel.

**Hardin.**—Sand and gravel pits were operated by Clary Concrete Materials, Eldora, near Gifford; Iowa Falls Sand & Gravel Co., George Janssen, and Weaver Construction Co., all of Iowa Falls; and Maudlin Construction Co., Webster City. The output was used for building and road construction.

Beu & Sons Co. (Grundy Center) operated the Jeske, Pierce, and Vigars limestone quarries. Limestone quarries also were operated by Iowa Limestone Co., of Des Moines, at Alden, and Weaver Construction Co., of Iowa Falls. The output was dimension stone for rubble and crushed stone for agricultural stone, asphalt filler, concrete aggregate, mineral food, and other uses.

**Harrison.**—Schemmer Limestone Quarry (Logan) produced limestone for agricultural stone, concrete aggregate, riprap, and rubble. The county highway department contracted for paving gravel.

**Henry.**—Winfield Brick & Tile Co. (Winfield) produced miscellaneous clay for heavy clay products.

Production of crushed limestone for agricultural stone, concrete aggregate, and riprap was reported by Camanche Stone Co., Davenport; Kaser Construction Co., Des Moines, operating the Kopock quarry; and the county engineer, Mount Pleasant.

**Howard.**—Ed Kubik, Zobeck Limestone & Gravel Co. (Elma), and the county highway department produced gravel for paving and road construction. Bouska Construction Co. (Provitin) and Grupp

Digitized by Google

Construction Co. (Riceville) produced limestone for concrete aggregate.

**Humboldt.**—Sand and gravel was produced by Iowa Sand & Gravel Co. (Humboldt) for building, road-construction, and miscellaneous uses. The county highway department contracted for paving gravel.

Limestone for agricultural stone, concrete aggregate, and riprap was credited to Place Brothers (Scranton) and Welp & McCarten, Inc. (Fort Dodge) at Humboldt.

**Jackson.**—Bellevue Sand & Gravel Co. (Bellevue) produced sand and gravel for road construction.

**Jasper.**—Sand and gravel for building, road construction, and miscellaneous uses was produced by Eben Van Dusseldorp, Colfax; Maudlin Construction Co., Webster City; Newton Rock & Gravel Co., Newton, at Reasnor; and Earl Wagner, Monroe.

**Jefferson.**—Crushed limestone for agricultural stone and concrete aggregate was produced by Triangle Construction Co. (Fairfield).

**Johnson.**—Sand and gravel for building and road construction was produced by Stevens Sand & Gravel Co., Inc. (Iowa City). Limestone for agricultural stone, concrete aggregate, railroad ballast, and riprap was quarried by River Products Co., Iowa City; and Schroeder Co., McGregor, at Cou Falls.

**Jones.**—Jensen Sand & Gravel (Anamosa) and Reichart Sand & Gravel Co. (Monticello) produced sand and gravel for building and road construction.

Limestone for concrete aggregate was produced by B. L. Anderson, Inc. (Cedar Rapids).

**Keokuk.**—John Nelson & Sons (What Cheer) produced clay for use in heavy clay products.

Kaser Construction Co. (Des Moines) quarried limestone at Sigourney for agricultural stone and concrete aggregate.

**Kossuth.**—The county highway department produced and contracted for paving sand and gravel.

**Lee.**—Horn's Sand Pit (Fort Madison) produced building and engine sand. Raid Brothers Construction Co. (Burlington), operating the Stationary and Hawkeye Quarries, and the county highway department produced limestone for agricultural stone, concrete aggregate, railroad ballast, and riprap.

**Linn.**—Sand and gravel for building and road construction was produced by Concrete Materials & Construction Co. and King's Crown Plaster Co (Cedar Rapids) and Frank J. Meyer (Mount Vernon). Limestone for agricultural stone, asphalt filler, concrete aggregate, and riprap was produced by B. L. Anderson, Inc., Concrete Materials & Construction Co., and L. Crawford Lime & Quarry Co., all of Cedar Rapids; C. B. Dewees Construction Co., Marion, operating the Paralta Quarry; and E. D. Robbins, Palo.

**Louisa.**—Beu & Sons Co. (Grundy Center) operating the Oakville Pit, produced road-construction gravel. Limestone was quarried by Camanche Stone Co., Davenport; Dillon Stone Co., and Stone Products Co., Inc., Columbus Junction; and Louisa County Lime Products, Wapello. Production was used for agricultural stone, concrete aggregate, and riprap.

**Lucas.**—Bituminous coal was produced from an underground mine by Big Ben Coal Co.

Digitized by Google

**Lyon.**—Production of gravel for road construction was reported by Maudlin Construction Co. (Webster City). The county highway department produced and contracted for paving gravel.

**Madison.**—Production of limestone for agricultural stone, cement, and concrete aggregate was reported by Concrete Materials & Construction Co., Cedar Rapids; Gendler Stone Products, Des Moines; Marquette Cement Manufacturing Co., Chicago, Ill., at Earlham; E. I. Sargent Quarries, Inc., Des Moines; and the county highway department.

The county highway department contracted for paving sand and gravel.

**Mahaska.**—What Cheer Clay Products Co. (What Cheer) and Oskaloosa Clay Products Co., (Oskaloosa) mined fire clay and miscellaneous clay for use in heavy clay products.

Bituminous coal was mined from 1 underground mine by Edwards Coal Co. and from 9 strip mines by Angus Coal Co., Carbon Hill Coal Co., Engnes Coal Co., Knight Coal Co., Lost Creek Coal Co., Mich Coal Co., Patik Coal Co., Star Coal Co., and VerSteeg Coal Co.

The Concrete Materials Co. (Cedar Rapids) produced sand and gravel for building and road construction. Limestone was produced by the county engineer (Oskaloosa) and Kaser Construction Co. (Des Moines, at Fremont) for agricultural stone and concrete aggregate.

**Marion.**—Marion was the leading coal-producing county in Iowa in 1956. Nine strip mines and nine underground mines were operated. Strip-mining was reported by Beard Coal Co., Husted Brothers Coal Co., Jude Coal Co., Inc., Kirkville Coal Co., Newton Coal Co., Ruby Coal Co., VerSteeg Coal Co., Weldon Coal Co., and Wilkinson Coal Co. Coal was mined underground by Cedar Creek Coal Co., Desplanque Coal Co., Furnald Coal Co., Godfrey Coal Co., Good Coal Co., Liberty Coal & Mining Co., Liter Coal Co., Inc., Lovilia Coal Co., and Twin City Coal Co.

E. Groenendyk & Son (Bussey) and Pella Construction Co. (Pella) produced sand and gravel for building, road construction, and miscellaneous uses. Limestone was quarried by C. D. Hess & Son and Rock Material Co., Lacona; Kibbey Limestone Co., Carlisle, near Knoxville; and Pella Limestone Co., Pella. Agricultural stone, concrete aggregate, and riprap were produced.

**Marshall.**—Empire Sand & Material Co. (Marshalltown) produced sand and gravel for building, road construction, railroad ballast, and miscellaneous uses. Concrete Materials & Construction Co. (Cedar Rapids) quarried and produced concrete aggregate and agricultural stone.

**Mills.**—Limestone for agricultural stone and concrete aggregate was produced by Henningson Construction Co., Atlantic; Missouri Valley Limestone Co., Oakland; and Jack Stanley, Thurman.

**Mitchell.**—Sand and gravel for building, filter, road construction, and miscellaneous uses was produced by Lawrence H. Decklever and Seeber & Wetter, Osage; and L. R. Falk, St. Ansgar. L. R. Falk (St. Ansgar), operating near Osage, and Edd Kollman (Osage) produced limestone for agricultural stone and concrete aggregate.

**Monona.**—Maudlin Construction Co. (Webster City) produced road-construction gravel.

Digitized by Google

**Monroe.**—Bituminous coal was mined from six underground mines by Acme Coal Co., Airline Coal Co., Karpan Coal Co., Maple Coal Co., O'Brien Coal Co., and White Oak Coal Co. Halverson Coal Co., C. N. Knox Coal Co., and Weldon Coal Co. mined coal from strip mines.

The county engineer (Albia) produced limestone for concrete aggregate.

**Montgomery.**—Kaser Construction Co. (Des Moines) at Red Oak and Missouri Valley Limestone Co. (Oakland) produced limestone for agricultural stone and concrete aggregate.

**Muscatine.**—Sand and gravel was produced by Acme Fuel & Material Co., Hahn Brothers Sand & Gravel Co., and Northern Gravel Co., Muscatine. Blast, engine, and filter sand were produced, also sand and gravel for building, road construction, and miscellaneous uses. Otto Wendling, Muscatine, quarried limestone for concrete aggregate.

**O'Brien.**—Gilbert Bruegman (Hartley) and Maudlin Construction Co. (Webster City) produced building and road construction sand and gravel. The highway departments of Clay and O'Brien Counties contracted for paving gravel.

**Osceola.**—Sand and gravel was produced by Beu & Sons Co., Grundy Center, operating the Osceola Pit; Hallett Construction Co., Crosby, Minn., operating the Aston No. 1 and 2 plants; Hogan & Faber, Rock Rapids; and Van Drie Construction Co., Ocheyedan. The output was used for building, road construction, and miscellaneous purposes. The county highway department contracted for paving sand.

**Palo Alto.**—Sand and gravel for building and road construction was produced by Bauck Construction Co., Emmetsburg; and John Dorweiler Sand & Gravel Co., West Bend. The county highway department contracted for paving gravel.

**Plymouth.**—Beu & Sons Co. (Grundy Center) operating the Plymouth Pit, Higman Sand & Gravel Co. (Akron), Maudlin Construction Co. (Webster City), Wiltgen Ready Mixed Concrete (Le Mars), and the county highway department produced building, paving, and road-construction sand and gravel.

**Pocahontas.**—Hallett Construction Co. (Crosby, Minn.), with operations at Plover and Sioux Rapids, and the county highway department produced sand and gravel for building, paving, and road construction.

Midwest Limestone Co., Inc. (Gilmore City), quarried limestone for agricultural stone, concrete aggregate, and riprap.

**Polk.**—Polk County yielded minerals valued at more than $12 million. Included were cement, clays, coal, sand and gravel, and stone.

Clay pits of Des Moines Clay Co. and Iowa Pipe & Tile Co. (Des Moines) and United States Brick & Tile Co. (Kansas City, Mo.), operating their No. 3 plant near Des Moines, yielded fire clay and miscellaneous clay for manufacturing heavy clay products.

Bituminous coal was produced from a strip mine by Hopkins Coal Co.

Portland and masonry cements were produced by Hawkeye Portland Cement Co. of Iowa (a subsidiary of the Marquette Cement Mfg. Co.), Chicago, Ill., and Penn-Dixie Cement Corp., Nazareth, Pa.; both operated near Des Moines. These companies also produced

Digitized by Google

clay and limestone for use in cement manufacture. The Hawkeye Portland Cement Co. operated two kilns: One was 475 feet long and the other 465 feet long; both were 11 feet 6 inches in diameter. In 1956 a raw mill and a finish mill were added to the plant. Penn-Dixie Cement Corp. operated two-240-foot by 8-foot-10-inch upper- and 10-foot-1-inch lower-end-diameter kilns.

Sand and gravel was produced by I. J. Bishop, Mitchellville, at Des Moines; Concrete Materials Co., Cedar Rapids; Coon Valley Gravel Co., West Des Moines Sand Co., and Keefner Sand & Gravel Co., Des Moines; J. W. Lehman, Sheldahl; Maudlin Construction Co., Webster City; and the city engineer. Production was used for building, paving, road construction, and miscellaneous purposes.

Dresser Trap Rock Co. (Dresser) and Gendler Stone Products, Keefner Sand & Gravel Co., and E. I. Sargent Quarries, Inc. (Des Moines) produced limestone for concrete aggregate.

**Scott.**—Dewey Portland Cement Co. (Kansas City, Mo.) produced portland and masonry cements at Davenport. The company operated 5 kilns, of which 2 were reactivated in 1956. The company also produced clay and cement rock locally and produced and sold crushed stone.

Linwood Stone Products Co., Inc. (Buffalo) produced quick and hydrated lime for building, chemical, and industrial uses. The plant has 1 rotary and 2 shaft kilns, also a continuous-type hydrator.

Building sand was produced by Builders Sand & Gravel Co., Davenport.

Le Claire Quarries (Le Claire), Linwood Stone Products Co., Inc. (Buffalo), and the county highway department produced dimension rubble and flagging, as well as crushed stone for use as asphalt filler, agricultural stone, concrete aggregate, flux, rock dust for coal mines, lime, mineral food, railroad ballast, and riprap.

**Sioux.**—Sand and gravel production was reported by L. G. Everist, Inc., Sioux Falls, S. Dak.; Floyd Gravel Co., Orange City; Hawarden Gravel Co., Hawarden; Maudlin Construction Co., Webster City; Rock Valley Cement Block & Tile Co., Rock Valley; and Roos Sand & Gravel, Boyden. The output was used for building, road construction, and miscellaneous purposes.

**Story.**—Nevada Brick & Tile Co. (Nevada) produced clays for use in manufacturing heavy clay products. Building sand and gravel was produced by Roberson Brothers, Ames. The limestone quarry and gravel pit of Cook Construction Co. (Ames) yielded material for use in asphalt filler, agricultural stone, concrete aggregate, and road construction.

**Tama.**—Flint Crushed Gravel Co. (Des Moines, at Tama) produced sand and gravel for building and road construction.

B. L. Anderson, Inc. (Cedar Rapids) and Joseph Wenke (Toledo) produced crushed stone for agricultural stone, concrete aggregate, and riprap.

**Union.**—Production of crushed stone for concrete aggregate was credited to E. F. Schildberg (Greenfield). The county highway department contracted for paving gravel.

**Van Buren.**—Hamlin Bros. Coal Co. and Laddsdale Coal Co., Inc., operated strip mines. Valley Limestone & Gravel, Inc. (Farmington), produced sand and gravel for building and road construction.

Digitized by Google

Douds Stone, Inc. (Douds) and Triangle Construction Co. (Fairfield) produced limestone for agricultural stone and concrete aggregate.

**Wappelo.**—Oskaloosa Clay Products Co. (Oskaloosa, operating near Ottumwa), and Ottumwa Brick & Tile Co. (Ottumwa), mined clays for use in manufacturing heavy clay products.

Bituminous coal was produced from 1 underground mine by New Globe Coal Co. (Ottumwa) and from 4 strip mines by Homer Haines Coal Co., Inc., Lanning Coal Co., Munterville Coal Co., Inc., and Star Coal Co.

Sand for building and road construction was produced by Combs Sand Co. (Ottumwa).

Kaser Construction Co. (Des Moines), operating near Eddyville, and Wapello Stone Quarries (Ottumwa) produced limestone for agricultural stone and concrete aggregate.

**Warren.**—Carlisle Brick & Tile Co. (Carlisle) and Goodwin Tile & Brick Co. (Des Moines, operating near Carlisle), mined clays for use in heavy clay products.

S. & R. Coal Co. (Carlisle) mined coal underground.

**Washington.**—Hayes Quarry (Washington) produced limestone for concrete aggregate.

**Webster.**—Clays, gypsum, sand and gravel, and stone were produced in the county.

Clays for heavy clay products were produced by Johnston Clay Works, Inc., Kalo Brick & Tile Co., Lehigh Sewer Pipe & Tile Co., and Vincent Clay Products Co., all at Fort Dodge.

Crude gypsum was mined and processed in the Fort Dodge area by Bestwall Gypsum Co. (formerly Certain Teed Products Corp.), The Celotex Corp., National Gypsum Co., and United States Gypsum Co. All had board plants except the Celotex Corp., which announced plans for such a plant, with completion scheduled for 1957.

John Bloomquist and Derrald Carlson (Dayton), Casey Sand & Gravel and Wayne Goodrich (Lehigh), and Welp & McCarten, Inc. (Fort Dodge), produced sand and gravel for building and road construction. The highway departments of Calhoun and Webster Counties produced and contracted for paving gravel.

Limestone was quarried underground by Fort Dodge Limestone Co. (Fort Dodge), for agricultural stone, concrete aggregate, and filter beds.

**Winnebago.**—Hallett Construction Co. (Crosby, Minn.) at Forest City and the county highway department produced sand and gravel for building, paving, road construction, and miscellaneous uses.

**Winneshiek.**—Carlson Materials Co., Inc. (Decorah) produced sand and gravel for building and road construction.

Limestone was quarried by Bouska Construction Co., Protivin; Bruening Rock Products, Inc., and Seegmiller Construction Co., Decorah; J. F. Pavlovec, Calmar; and Roverud Construction Co., Spring Grove, Minn. The output was used for agricultural stone and concrete aggregate.

**Woodbury.**—Concrete Materials Co. (Cedar Rapids, operating near Correctionville), Maudlin Construction Co. (Webster City), and Westfork Sand & Gravel Co. (Sioux City, operating near Moville) produced sand and gravel for building and road construction.

**Worth.**—Peat was dug from bogs near Hanlontown by Eli Colby Co. and Colby Pioneer Peat Co.

Digitized by Google

L. R. Falk (St. Ansgar) and Maudlin Construction Co. (Webster City) produced gravel for road construction.

Limestone Products Co. (Fertile) produced limestone for agricultural stone and concrete aggregate.

**Wright.**—Maudlin Construction Co. (Webster City), Oscar Nelson (Belmond) and the county highway department produced sand and gravel for building, paving, road construction, and railroad ballast.

Digitized by Google

Digitized by Google

# The Mineral Industry of Kansas

This chapter has been prepared with the cooperation of the State Geological Survey of Kansas.

By Harvard Eng,[1] Walter H. Schoewe,[2] and Edwin D. Goebel[2]

FOR THE SEVENTH consecutive year a new high in mineral value has been established in Kansas as mineral production ($493 million) exceeded the 1955 record year by approximately $22 million.

A 236-mile, 4-lane, Kansas Turnpike was completed in October and highlighted construction activities during 1956. Approximately $21 million was spent on county road construction and maintenance during 1956. A new salt industry for the manufacture of salt petrochemicals was established near Wichita. Exploratory drilling resulted in discovery of 179 oil and gas fields, of which 5 fields were revived. Discovery of gas in Wallace County opened a new gas area in the northwestern part of the State. Water was reported as a mineral commodity in Kansas for the first time. One hundred and two of the 105 counties in Kansas reported mineral production in 1956.

Crude petroleum composed 70 percent of the total mineral value in 1956, and mineral fuels represented 85 percent of this total. Other leading minerals, following petroleum in order of value, were: Natural gas, cement, stone, and natural-gas liquids. Eighteen counties had mineral production valued at more than $10 million. These counties, in order of rank, were: Barton, Ellis, Russell, Butler, Rooks, Greenwood, Stafford, Rice, Graham, Cowley, Cherokee, Grant, Allen, Barber, Stevens, McPherson, Sedgwick, and Pawnee. All minerals except gypsum, pumice, and stone increased in value from 1955.

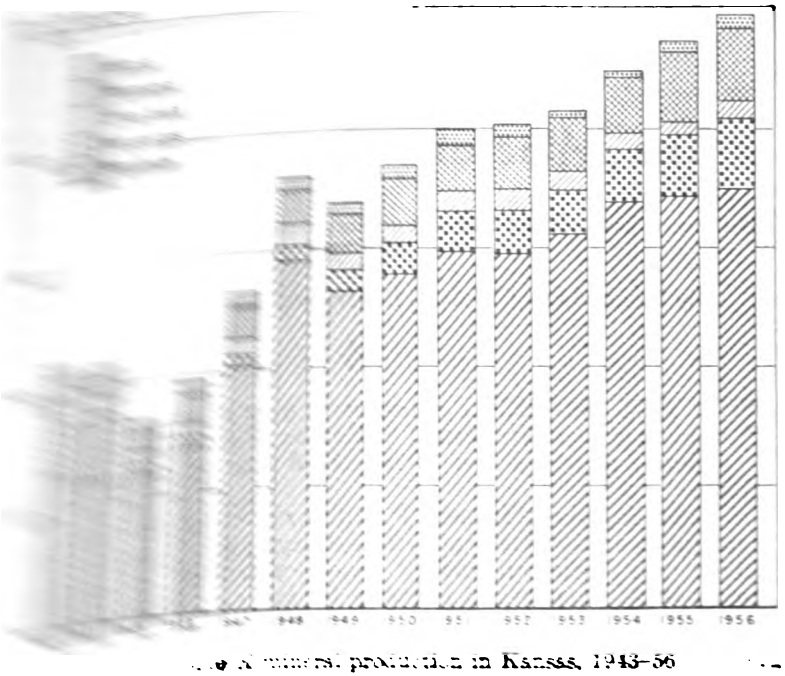
---

[1] Chemical engineer, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] Geologist, State Geological Survey of Kansas, University of Kansas, Lawrence, Kans.

465877—58——30



Digitized by Google




Value of mineral production in Kansas, 1948–56

**Mineral production in Kansas, 1955–56** [1]

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (or as otherwise stated) | Value | Short tons (or as otherwise stated) | Value |
| 100-pound barrels | 9,077,767 | $29,520,533 | 10,239,578 | $29,370,845 |
| do. | 382,525 | 1,333,304 | 338,739 | 1,324,928 |
| | 9,782,662 | 573,016 | 877,090 | 1,169,043 |
| cubic feet | 742,282 | 3,165,998 | 833,577 | 5,556,350 |
| | 42,730,000 | 662,629 | 43,035,200 | 698,000 |
| (gross, est.) | 3,405 | 1,526,474 | 7,535 | 2,397,390 |
| million cubic feet | 477,761 | 32,286,000 | 526,091 | 59,445,000 |
| thousand gallons | 118,599 | 4,325,000 | 105,482 | 5,928,000 |
| do. | 62,596 | 2,845,000 | 80,267 | 3,843,000 |
| thousand 42-gallon barrels | 229,695 | 340,670,000 | 238,204 | 346,529,000 |
| | 2,529 | 38,731 | (6) | (6) |
| | 631,885 | 8,452,525 | 1,004,042 | 9,167,364 |
| | 31,894,986 | 4,976,998 | 32,515,394 | 5,022,312 |
| | 32,485,381 | 13,446,240 | 33,433,552 | 13,703,345 |
| | 27,[illegible] | 6,702,309 | 28,963 | 7,554,210 |
| | | 1,613,536 | | 1,465,012 |
| | | 470,530,000 | | 493,307,000 |

[illegible] by mine shipments, sales, or marketable production (including consumption

[illegible] value for which is included with "Value of items that cannot be disclosed."

[illegible] value for which is included with "Value of items that cannot be disclosed."

[illegible] to avoid disclosing individual company confidential data.

[illegible] adjusted to eliminate duplicating values of clays and stone.

Digitized by Google

**TABLE 2.—Average unit value of mineral commodities produced in Kansas, 1951–56**

| Commodity | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Cement: | | | | | | |
| Portland.....376-pound barrel.. | $2.38 | $2.38 | $2.51 | $2.63 | $2.70 | $2.87 |
| Masonry.....do.... | | | | | 3.49 | 3.69 |
| Natural.....do.... | 2.69 | 3.01 | 2.98 | 2.96 | 2.95 | 3.16 |
| Clays.....short ton.. | 1.00 | 1.19 | 1.12 | 1.20 | 1.26 | 1.20 |
| Fire clay.....do.... | 2.09 | 2.18 | 2.00 | 2.00 | 2.34 | 2.22 |
| Miscellaneous.....do.... | .96 | 1.30 | 1.06 | 1.22 | 1.28 | 1.04 |
| For cement manufacture.....do.... | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Coal.....do.... | 3.94 | 3.90 | 3.92 | 4.02 | 4.27 | 4.36 |
| Gypsum.....do.... | 1.66 | 1.62 | 1.67 | 1.55 | 2.09 | 1.82 |
| Gravel.....do.... | .55 | .54 | .54 | .69 | .65 | .61 |
| Helium.....per thousand cubic feet.. | 12.44 | 12.75 | 13.18 | 15.81 | 15.50 | 15.50 |
| Lead.....pound.. | .173 | .161 | .131 | .137 | .149 | .157 |
| Natural gas.....per thousand cubic feet.. | .081 | .083 | .086 | .106 | .111 | .113 |
| Natural-gas liquids: | | | | | | |
| Natural gasoline and cycle products per gallon.. | .062 | .063 | .056 | .050 | .053 | .056 |
| LP-gases.....do.... | .036 | .040 | .034 | .031 | .029 | .043 |
| Petroleum.....per 42-gallon barrel.. | 2.57 | 2.56 | 2.69 | 2.81 | 2.80 | 2.79 |
| Pumice.....short ton.. | 3.20 | 7.86 | 11.42 | 3.96 | 25.74 | 20.72 |
| Salt.....do.... | 7.37 | 7.51 | 8.26 | 8.87 | 9.26 | 9.13 |
| Brine.....do.... | | | | | | 3.50 |
| Evaporated.....do.... | 12.91 | 13.31 | 14.26 | 15.37 | 16.09 | 17.03 |
| Rock.....do.... | 3.67 | 3.75 | 4.10 | 4.43 | 4.76 | 5.19 |
| Sand.....do.... | .65 | .63 | .70 | .69 | .65 | .65 |
| Stone: | | | | | | |
| Limestone: Crushed.....do.... | 1.31 | 1.38 | 1.35 | 1.23 | 1.34 | 1.30 |
| Dimension.....do.... | 18.28 | 16.22 | 15.65 | 18.71 | 17.90 | 24.09 |
| Miscellaneous.....do.... | .30 | .37 | .40 | .35 | .41 | .38 |
| Sandstone: Crushed.....do.... | 1.60 | 1.65 | 1.35 | 1.87 | 1.64 | 1.58 |
| Dimension.....do.... | .80 | 1.25 | | 7.89 | 19.62 | 19.62 |
| Limestone for cement manufacture do.... | | | | .89 | 1.00 | .90 |
| Zinc.....pound.. | .182 | .166 | .115 | .108 | .123 | .137 |

## EMPLOYMENT AND INJURIES

The estimated average annual employment of the mining industries in Kansas was the same as 1955, with an average of 19,000 persons. Lead-zinc mines and quarries reported increases of 12 and 11 percent, respectively. Employment in lead-zinc mining increased with larger mine and smelter output during the year.

Nonmetallic mineral mining and quarrying showed a greater annual employment, which resulted, in part, from increased construction activity. Limestone quarries reported the highest estimated average with 853 people, and sand and gravel operations employed an estimated average of 649 persons, according to the Employment Security Division, Department of Labor. Total nonmetallic mining, excluding sand and gravel operators, employed 3,259; 2,272 in stone quarrying. Employment in the mining industries remained the smallest part of the total of the nonagricultural industries in the State.[3]

**TABLE 3.—Average annual employment, mining industries and products of petroleum and coal, 1947–51 (average) and 1952–56** [1]

| Industry group | 1947–51 | 1952 | 1953 | 1954 | [2] 1955 | 1956 |
|---|---|---|---|---|---|---|
| Mining (total) | 17,240 | 18,900 | 18,500 | 18,400 | 19,000 | 19,000 |
| Metal | 820 | 600 | 400 | 300 | 400 | 450 |
| Nonmetal | 1,520 | 1,700 | 1,700 | 1,600 | 1,850 | 2,050 |
| Coal | 1,000 | 700 | 500 | 500 | 350 | 350 |
| Petroleum and natural-gas extraction | 13,920 | 15,900 | 15,900 | 16,000 | 16,400 | 16,150 |
| Products of petroleum and coal | 5,120 | 5,200 | 5,400 | 5,000 | 4,900 | 4,900 |

[1] Employment Security Division, Department of Labor, State of Kansas.
[2] Revised figures.

[3] Employment Security Division, Department of Labor, State of Kansas Press release, 1956.

Digitized by Google

**Injuries.**—Mineral industries, excluding petroleum, reported 3 fatal accidents, 15 partial permanent injuries, and 142 temporary injuries. The nonmetal industry, with 3,259 men employed during the year, reported 2 fatal injuries, 10 partial permanent injuries, and 97 temporary injuries. Metal mining experienced 1 fatal injury, 5 partial permanent, and 38 temporary injuries. Coal mining reported the lowest injury experience, with seven temporary injuries.

**Wages.**—The average weekly earnings of the mining industry was $96.02, with an average of 43.2 hours worked per week, according to the Employment Security Division of the Kansas Labor Department. This represented an increase of $8.25 per week, and the average weekly hours rose 0.8 hour from the previous year. Petroleum mining increased $7.88 in average weekly earnings to $96.07, and average weekly hours rose 0.7 hour to 42.3 hours.

Production and exploration in the oil industry, road and building construction, and growing mineral economy directly reflected the higher weekly earnings. Overtime was another important factor in the higher weekly earnings and longer weekly hours.[4]

**TABLE 4.—Injury experience of selected mining industries in 1956**

| Industry group | Number of mines | Average active days | Men employed | Man-days | Man-hours | Days disability (nonfatal) [1] | Injury experience [1] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fatal | Nonfatal | Severity rate | | Frequency rate | |
| | | | | | | | | | Fatal | Nonfatal | Fatal | Nonfatal |
| Metal: Lead-zinc | 22 | 283 | 394 | 111,566 | 889,932 | 3,249 | 1 | 43 | 6.74 | 3.65 | 1.12 | 48.32 |
| Nonmetals: [3] | | | | | | | | | | | | |
| Abrasives | 5 | 33 | 9 | 294 | 2,500 | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| Gypsum | 4 | 293 | 296 | 86,703 | 693,631 | 49 | 1 | 2 | 8.65 | 0.07 | 1.44 | 2.88 |
| Salt and brine | 8 | 309 | 425 | 131,223 | 1,063,401 | 4,526 | 1 | 22 | 5.64 | 4.26 | 0.94 | 20.69 |
| Clays | 15 | 244 | 257 | 62,628 | 517,883 | 2,092 | ------ | 16 | ------ | 3.95 | ------ | 30.90 |
| Stone | 93 | 247 | 2,272 | 562,024 | 4,615,584 | (2) | ------ | 67 | (2) | (2) | ------ | 14.52 |
| Fuel: Coal | 24 | 245 | 272 | 66,511 | 499,632 | (2) | ------ | 7 | ------ | ------ | ------ | 14.01 |

[1] 1 fatal accident and 1 permanent total accident are equivalent to 6,000 days lost.
Excludes sand and gravel.
Data not available.

## TRANSPORTATION

The Santa Fe Trail has been replaced by a modern one, the Kansas Turnpike. This ultramodern tollroad was completed in October and was culminated in 22 months. The superhighway will aid, indirectly, the mineral industries.

Freight movement by barge on the Missouri River dropped sharply from 1955. Barge companies could not compete with the railroads because of shallowness of the river channel. Reduced freight rates and special rates for processing in transit offered by the railroads does not normally remove barge shipping from competing in freight shipments, but the shallow channel does not permit barges on the Missouri River to carry full loads. Proposed deepening of the channel to 12 feet would permit the barge companies to compete with the railroads again. The resultant stabilization, or perhaps lowered freight rates

[4] Work cited in footnote 3.

Digitized by Google

brought about by dredging the Missouri River to a depth of 12 feet, would further induce new industries to Kansas.

In 1956 the county engineers of Kansas built 6,665 miles of roads at a total cost of over $11 million and maintained 61,047 miles of roads at a cost of approximately $10 million. Road construction and maintenance have a direct impact on the nonmetallic mineral production in the State. The only counties not reporting county road construction were: Atchison, Brown, Cheyenne, Dickinson, Grant, Lincoln, Morton, Stanton, and Wallace.[5]

Two natural-gas pipelines were being constructed in 1956, according to the Oil and Gas Journal. Twenty-eight miles of 16-inch line was being laid between Leavenworth, Leavenworth County, to St. Joseph, Mo. Seven miles of 10-inch line was constructed in North Topeka.

**TABLE 5.—County road construction in 1956, by types [1]**

| Type | County disbursements | | | Contractor disbursements | | |
|---|---|---|---|---|---|---|
| | Miles | Value | Average cost per mile | Miles | Value | Average cost per mile |
| Standard graded and drained | 2,826 | $3,471,763 | $1,229 | 174 | $499,192 | $2,617 |
| One course gravel or stone | 1,060 | 786,395 | 742 | 206 | 224,770 | 1,093 |
| Gravel or stone on existing surface | 530 | 390,934 | 738 | 51 | 33,903 | 662 |
| Gravel or stone stabilization | 539 | 761,819 | 1,413 | 32 | 100,771 | 3,149 |
| Bituminous surface treated | 659 | 1,179,638 | 1,790 | 125 | 242,486 | 1,942 |
| Bituminous surface treated (including base) | 311 | 1,056,087 | 3,393 | 108 | 446,217 | 4,139 |
| Bituminous mix (on existing surface) | 28 | 116,034 | 4,106 | 8 | 25,960 | 3,245 |
| Bituminous mix (including base) and pavement | 4 | 81,779 | 21,132 | 4 | 67,300 | 18,694 |
| Total | 5,957 | 7,844,449 | 1,317 | 708 | 1,640,599 | 2,319 |
| Grand total | 6,665 | 9,485,048 | 1,423 | | | |
| Total all costs for construction [2] | | 11,079,182 | | | | |

[1] State of Kansas, State Highway Commission of Kansas, Highway Planning Department, County Engineers' Annual Report: 1956, 137 pp.
[2] Includes all other costs for road construction, bridges, rights-of-way, culverts, etc.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

Mineral fuels have had an important role in Kansas economy; growth and development have been associated with these commodities. The value of all mineral fuels increased over 1955. Secondary recovery of crude petroleum has become an important method for producing oil in the State.

Of 179 new fields discovered during 1956, 132 discovery wells produced oil, 36 gas, and 3 oil and gas; 8 were dry. Ellis County led in discoveries, with 19 new oilfields, followed by Barber County with 2 oil and 12 gas fields, Stafford County with 12 oilfields and 1 gas field, and Cowley County with 10 oilfields and 1 oil and gas field.

**Carbon Black.**—Carbon-black production in Kansas increased 9 percent from 1955. Increased quantities of natural-gas liquids were used

[5] State of Kansas, State Highway Commission of Kansas, Highway Planning Department, County Engineers' Annual Report: 1956, 137 pp.

Digitized by Google

in manufacturing carbon black, replacing natural gas as the feed stock.

**Coal.**—Mined output of coal increased 19 percent in quantity and 22 percent in value, despite a smaller number of operators. Production during the year was confined to larger producers, of which only 19 mines reported production over 1,000 tons. The average price for coal advanced 9 cents to $4.36 per ton and was mainly responsible for the increased tonnage.

**TABLE 6.—Production of coal, 1947–51 (average) and 1952–56**

| Year | Number of mines | | | Short tons | Value | |
|---|---|---|---|---|---|---|
| | Underground | Strip | Total | | Total | Average per ton |
| 1947–51 (average) | 22 | 37 | 59 | 2,279,954 | $8,550,984 | $3.75 |
| 1952 | 15 | 32 | 47 | 2,028,601 | 7,902,590 | 3.90 |
| 1953 | 28 | 21 | 49 | 1,715,004 | 7,101,386 | 4.14 |
| 1954 | 10 | 30 | 40 | 1,372,294 | 5,602,808 | 4.08 |
| 1955 | 5 | 19 | 24 | 742,282 | 3,165,868 | 4.27 |
| 1956 | 4 | 15 | 19 | 883,877 | 3,856,330 | 4.36 |

**Helium.**—Helium shipments from the Government plant at Otis in 1956 exceeded the previous year by 5 percent, as the Government attempted to meet the increased demands of industry and Federal agencies. The use of helium for shielded-arc welding continued to grow, as industry was provided with a new tool to fabricate aluminum, magnesium, and equipment from special alloys.

**Natural Gas.**—Kansas natural-gas producing area was expanded in 1956 by the discovery of gas in Wallace County. The discovery well of Skelly Oil Co. reported an initial potential of 6 million cubic feet a day; however, no production was reported because of the lack of pipeline connection. The Kansas portion of the Hugoton gas area, which produced 73 percent of the total natural gas in the State, includes 2 entire counties (Stevens and Grant) and parts of 7 other counties (Finney, Hamilton, Haskell, Kearny, Morton, Seward, and Stanton). The Hugoton gas area was first discovered in Seward County in 1922. The first well was assigned to the Liberal gas field, which was later included with the Hugoton.

Producing formations of the Hugoton gas area was limited by definition to the Chase Group of the Permian, which lies at an average depth of 2,500 feet. The Kansas Corporation Commission set well spacing in this area to 1 well per 640 acres.

Production of natural gas increased 12 percent in quantity and 14 percent in value to 526 billion cubic feet valued at $59 million from 1955. Estimated proved recoverable reserves of natural gas at the year end was 17,566 billion cubic feet—an 8-percent increase from the previous year.[6] During the year 36 new gas pools were discovered, of which important new fields were:[7]

[6] American Petroleum Institute and American Gas Association. Proved Reserves of Crude Oil, Natural-Gas Liquids and Natural Gas: Vol. 11, Dec. 31, 1956, p. 19.

[7] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas During 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub. Bull. 128, 1957, pp. 15–22.

Digitized by Google

| County: | Field name | Initial production (thousand cubic feet per day) |
|---|---|---|
| Barber | Driftwood | 54,000 |
| Do | Elsea | 25,000 |
| Do | Elwood | 7,340 |
| Do | McGuire | 27,100 |
| Do | Medicine Lodge West | 9,000 |
| Do | Sharon Northwest | 8,800 |
| Kingman | Goetz | 24,000 |
| Meade | Fincham | 30,000 |
| Do | Plains | 7,900 |
| Do | Sanders | 9,153 |
| Seward | Plains West | 21,000 |
| Stevens | Hanke | 7,500 |
| Do | Panoma | 16,124 |
| Wallace | Sexson | 14,000 |

**TABLE 7.—Marketed production of natural gas, 1947–51 (average) and 1952–56**

| Year | Million cubic feet | Value | Year | Million cubic feet | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 306,030 | $19,318,000 | 1954 | 412,369 | $43,711,000 |
| 1952 | 412,544 | 34,241,000 | 1955 | 471,041 | 52,286,000 |
| 1953 | 420,607 | 36,172,000 | 1956 | 526,091 | 59,448,000 |

**TABLE 8.—Marketed production of natural gas from the Kansas part of Hugoton gas area, 1941–56** [1]

| Year | Quantity (thousand cubic feet) | Year | Quantity (thousand cubic feet) | Year | Quantity (thousand cubic feet) | Year | Quantity (thousand cubic feet) |
|---|---|---|---|---|---|---|---|
| 1941 | 40,759,482 | 1945 | 90,345,203 | 1949 | 247,868,876 | 1953 | 387,635,243 |
| 1942 | 46,365,484 | 1946 | 119,637,983 | 1950 | 320,545,480 | 1954 | 346,732,192 |
| 1943 | 70,921,532 | 1947 | 157,663,036 | 1951 | 371,002,475 | 1955 | 394,257,153 |
| 1944 | 92,922,821 | 1948 | 185,872,594 | 1952 | 375,081,748 | 1956 | 381,874,779 |

[1] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas During 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub., Bull. 128, 1957, p. 31.

**TABLE 9.—Gas wells drilled in Hugoton gas area, cumulative to 1948 and 1949–56, by counties** [1]

| County | 1948 cumulative | 1949 drilled | 1950 drilled | 1951 drilled | 1952 drilled | 1953 drilled | 1954 drilled | 1955 drilled | 1956 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Drilled | Cumulative |
| Finney | 86 | 76 | 47 | 19 | 49 | 73 | 72 | 49 | 49 | 520 |
| Grant | 334 | 89 | 36 | 68 | 29 | 6 | 5 | 3 | 2 | 572 |
| Hamilton | 4 | 2 | 1 | 8 | 8 | 10 | 4 | ------- | 2 | 39 |
| Haskell | 171 | 42 | 39 | 33 | 30 | 27 | 39 | 40 | 19 | 440 |
| Kearny | 204 | 71 | 51 | 56 | 75 | 72 | 44 | 27 | 26 | 626 |
| Morton | 86 | 6 | 52 | 62 | 27 | 31 | 14 | 9 | 20 | 307 |
| Seward | 48 | 41 | 91 | 51 | 10 | 19 | 42 | 21 | 18 | 341 |
| Stanton | 125 | 9 | 17 | 25 | 7 | 27 | 24 | ------- | ------- | 234 |
| Stevens | 545 | 77 | 63 | 16 | 17 | 4 | 20 | 5 | 10 | 757 |
| Total | 1,603 | 413 | 397 | 338 | 252 | 269 | 264 | 154 | 146 | 3,836 |

[1] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas During 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub., Bull. 128, 1957, p. 32.

Digitized by Google

**Natural-Gas Liquids.**—Approximately 0.5 gallon of natural-gas condensate was obtained from each thousand cubic feet of natural gas processed from the Hugoton gas area. Nearly all of the natural gasoline and cycle plants were in this area.

Recovery of natural-gas liquids from 15 gasoline and cycle plants declined from production of the previous year to 196 million gallons; but, the value increased 9 percent to $9.8 million. The yield of natural gasoline and cycle products was smaller by 13.1 million gallons and LP-gases was 2 million gallons less than the previous year. An increase in the average price of $0.01 per gallon for both natural gasoline and LP-gases to $0.06 and $0.04 respectively was responsible for the rise in value.

**TABLE 10.—Natural-gas liquids produced, 1947–51 (average) and 1952–56**

| Year | Natural gasoline | | LP-gases | | Total | |
|---|---|---|---|---|---|---|
| | Thousand gallons | Value | Thousand gallons | Value | Thousand gallons | Value |
| 1947–51 (average) | 89,443 | $5,647,400 | 40,958 | $1,558,000 | 130,401 | $7,205,400 |
| 1952 | 115,206 | 7,286,000 | 77,406 | 3,116,000 | 192,612 | 10,402,000 |
| 1953–54 | (1) | (1) | (1) | (1) | (1) | (1) |
| 1955 | 118,599 | 6,318,000 | 92,596 | 2,643,000 | 211,195 | 8,961,000 |
| 1956 | 105,482 | 5,928,000 | 90,287 | 3,843,000 | 195,769 | 9,771,000 |

[1] Figure withheld to avoid disclosing individual company confidential data.

**TABLE 11.—Natural gasoline and LP-gases processed in 1956, in barrels [1]**

| Company | Location | | Natural gasoline | Butane | Propane | LP-gases | Total |
|---|---|---|---|---|---|---|---|
| | Nearest town | County | | | | | |
| Cities Service Oil Co. | Burrton | Reno | 59,686 | | 15,859 | 55,049 | 130,594 |
| Do | Wichita | Sedgwick | 379,042 | | 176,130 | 117,230 | 672,402 |
| Colorado Interstate Gas Co. | Lakin | Kearney | 95,218 | | | | 95,218 |
| Drillers Gas Co. | Cheney | Sedgwick | 19,997 | | | 8,686 | 28,683 |
| Dunn-Mar Oil & Gas Co. | Otis | Rush | 29,775 | 3,890 | | | 33,665 |
| Hughton Production Co. | Ulysses | Grant | 172,468 | 107,952 | 144,926 | | 425,346 |
| Kansas-Nebraska Natural Gas Co. | Deerfield | Kearney | 102,194 | | 2,302 | 13,624 | 118,120 |
| Kansas Power & Light Co. | Medicine Lodge | Barber | 75,092 | | | | 75,092 |
| Magnolia Petroleum Co. | Ulysses | Grant | 171,165 | 73,591 | 90,569 | | 335,325 |
| Northern Natural Gas Co. | Holcomb | Finney | 114,259 | | | | 114,259 |
| Do | Sublette | Haskell | 308,175 | | | | 308,175 |
| Panhandle Eastern Pipeline Co. | Liberal | Seward | 512,845 | 215,424 | 137,235 | | 865,504 |
| Skelly Oil Co. | Cunningham | Kingman | 43,034 | | | 42,642 | 85,676 |
| Stanolind Oil & Gas Co. | Ulysses | Grant | 426,802 | 390,975 | 561,598 | | 1,379,375 |
| The Texas Co. | Atlanta | Cowley | 40,934 | | | 38,879 | 79,813 |
| Total | | | 2,550,686 | 791,832 | 1,128,619 | 276,110 | 4,747,247 |

[1] Conservation Division, Kansas Corporation Commission.

Digitized by Google

Estimated proved recoverable reserves of natural-gas liquids declined for the second consecutive year to 7,208 million gallons, a decrease of 68 million gallons from 1955.[8]

**Petroleum.**—The relatively shallow oil-bearing stratum, the special inducement that nature has given oil operators to drill in Kansas, has been exploited. This exploitation maintained the Sunflower State in fifth position among oil-producing States.

Exploration for and recovery of oil was high in 1956. Nearly 124 million barrels of crude petroleum valued at $347 million was produced to set a new State record for the third consecutive year. Secondary recovery of oil increased slightly from the previous year. Exploratory drilling totaled 17 million feet.[9]

The average 1956 price of crude petroleum was $2.79 a barrel, a 1-cent reduction from 1955. Indicated demand was slightly higher than the previous year.

Shipments of oil, both in and out of the State, were larger. Crude oil, refined and used, climbed 7 percent.

**Drilling and Exploration.**—Wildcat drilling in Kansas was second only to Texas in the number of wells completed (1,073) in 1956, according to the Oil and Gas Journal. Most of the wildcatting took place on the Central Kansas uplift. Exploration activity became more intense in the northwestern counties late in the year. Search for new gas reserves was continued in the Hugoton gas area.[10] Exploratory drilling brought another county, Rawlins, into the list of oil-producing counties. Brumm field was discovered in June after 25 years of unsuccessful attempts.

A total of 5,028 exploration and development wells was completed during 1956, which represented an increase of 3 percent from 1955. The average depth of wells drilled in 1956 dropped 228 feet to an average of 3,543 feet per well though exploratory drilling increased 3 percent from the previous year. This decline may be explained in part by the large developmental drilling in secondary-recovery projects.

---

[8] Work cited in footnote 7, p. 10.
[9] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 141.
[10] Work cited in footnote 9.

Digitized by Google

**TABLE 12.—Oil- and gas-well drilling in 1956, by counties [1]**

| County | Proved or development wells | | | Exploratory wells | | | Total proved and exploratory wells | | | Grand total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Oil | Gas | Dry | Oil | Gas | Dry | Oil | Gas | Dry | |
| Barber | 28 | 65 | 49 | 3 | 22 | 56 | 31 | 87 | 105 | 223 |
| Barton | 118 | 1 | 104 | 26 | | 59 | 144 | 1 | 163 | 308 |
| Butler | 59 | | 35 | 2 | | 38 | 61 | | 73 | 134 |
| Chase | 2 | | | | | 9 | 2 | | 9 | 11 |
| Clark | 3 | 2 | 4 | 2 | 1 | 8 | 5 | 3 | 12 | 20 |
| Clay | | | | | | 3 | | | 3 | 3 |
| Cloud | | | | | | 4 | | | 4 | 4 |
| Coffey | 1 | | 8 | 1 | | 4 | 2 | | 12 | 14 |
| Comanche | | 1 | 1 | | 1 | 7 | | 2 | 8 | 10 |
| Cowley | 187 | 5 | 104 | 18 | 1 | 55 | 205 | 6 | 159 | 370 |
| Decatur | 10 | | 12 | 2 | | 9 | 12 | | 21 | 33 |
| Dickinson | 6 | | 5 | 1 | | 13 | 7 | | 18 | 25 |
| Douglas | | | | | | 2 | | | 2 | 2 |
| Edwards | | 1 | 6 | 5 | 3 | 21 | 5 | 4 | 27 | 36 |
| Ellis | 144 | | 106 | 32 | | 57 | 176 | | 163 | 339 |
| Ellsworth | 28 | | 22 | 2 | | 17 | 30 | | 39 | 69 |
| Finney | 6 | 34 | | 4 | 1 | 8 | 10 | 35 | 8 | 53 |
| Ford | | 1 | | 1 | | 5 | 1 | 1 | 5 | 7 |
| Geary | | | | | | 1 | | | 1 | 1 |
| Gove | 1 | | | | | 2 | 1 | | 2 | 3 |
| Graham | 129 | | 71 | 9 | | 73 | 138 | | 144 | 282 |
| Grant | | 2 | | | | | | 2 | | 2 |
| Greeley | | | | | | 4 | | | 4 | 4 |
| Greenwood | 99 | | 37 | 2 | | 13 | 101 | | 50 | 151 |
| Hamilton | | 2 | 1 | | 5 | 4 | | 7 | 5 | 12 |
| Harper | 26 | 1 | 8 | 4 | | 22 | 30 | 1 | 30 | 61 |
| Harvey | 11 | 1 | 11 | | 1 | 20 | 11 | 2 | 31 | 44 |
| Haskell | 4 | 17 | | | | 3 | 4 | 17 | 3 | 24 |
| Hodgeman | 2 | | | 3 | | 5 | 5 | | 5 | 10 |
| Jefferson | | | | | | 1 | | | 1 | 1 |
| Jewell | | | | | | 1 | | | 1 | 1 |
| Kearny | | 26 | 3 | 1 | | 3 | 1 | 26 | 6 | 33 |
| Kingman | 61 | 21 | 23 | 2 | 4 | 34 | 63 | 25 | 57 | 145 |
| Kiowa | 18 | 3 | 8 | 2 | 5 | 21 | 20 | 8 | 29 | 57 |
| Lane | | | | | | 1 | | | 1 | 1 |
| Leavenworth | | | | | | 2 | | | 2 | 2 |
| Lincoln | | | | | | 2 | | | 2 | 2 |
| Logan | | | | | | 4 | | | 4 | 4 |
| Lyon | 12 | | 5 | | | 11 | 12 | | 16 | 28 |
| Marion | 164 | | 50 | 15 | | 62 | 179 | | 112 | 291 |
| McPherson | 76 | 1 | 35 | 7 | 1 | 42 | 83 | 2 | 77 | 162 |
| Meade | 12 | 19 | 5 | 8 | 8 | 4 | 20 | 27 | 9 | 56 |
| Morris | 25 | | 6 | 2 | | 20 | 27 | | 26 | 53 |
| Morton | 33 | 50 | 13 | 1 | 6 | 3 | 34 | 56 | 16 | 106 |
| Ness | 20 | | 11 | 8 | | 30 | 28 | | 41 | 69 |
| Norton | 2 | | 3 | | | 17 | 2 | | 20 | 22 |
| Pawnee | 90 | 4 | 34 | 6 | 2 | 45 | 96 | 6 | 79 | 181 |
| Phillips | 7 | | 3 | 2 | | 7 | 9 | | 10 | 19 |
| Pratt | 10 | | 11 | 4 | | 20 | 14 | | 31 | 45 |
| Rawlins | | | | | | 2 | | | 2 | 2 |
| Reno | 2 | | 9 | | | 33 | 2 | | 42 | 44 |
| Rice | 76 | 1 | 45 | 12 | 1 | 30 | 88 | 2 | 75 | 165 |
| Rooks | 65 | | 65 | 10 | | 45 | 75 | | 110 | 185 |
| Rush | 23 | 1 | 10 | 2 | 1 | 22 | 25 | 2 | 32 | 59 |
| Russell | 100 | | 44 | 5 | | 14 | 105 | | 58 | 163 |
| Saline | 2 | | 1 | 1 | | 4 | 3 | | 5 | 8 |
| Scott | | | | | | 3 | | | 3 | 3 |
| Sedgwick | 50 | 2 | 25 | 8 | | 37 | 58 | 2 | 62 | 122 |
| Seward | | 20 | | | 2 | 1 | | 22 | 1 | 23 |
| Shawnee | | | | | | 1 | | | 1 | 1 |
| Sheridan | 4 | | 3 | 2 | | 20 | 6 | | 23 | 29 |
| Sherman | | | | | | 1 | | | 1 | 1 |
| Stafford | 96 | 1 | 76 | 23 | 2 | 68 | 119 | 3 | 144 | 266 |
| Stanton | | 4 | 1 | | | 2 | | 4 | 3 | 7 |
| Stevens | | 10 | | | 2 | 2 | | 12 | 2 | 14 |
| Sumner | 85 | 2 | 39 | 13 | | 57 | 98 | 2 | 96 | 196 |
| Thomas | | | | 1 | | 6 | 1 | | 6 | 7 |
| Trego | 54 | | 24 | 8 | | 53 | 62 | | 77 | 139 |
| Wabaunsee | 1 | | 1 | | | 4 | 1 | | 5 | 6 |
| Wallace | | | 1 | | 1 | 3 | | 1 | 4 | 5 |
| Wichita | | | | | | 2 | | | 2 | 2 |
| Woodson | 21 | | 16 | 1 | | 10 | 22 | | 26 | 48 |
| Total: 1956 | 1,973 | 298 | 1,154 | 261 | 70 | 1,272 | 2,234 | 368 | 2,426 | 5,028 |
| 1955 | 2,179 | 323 | 1,122 | 215 | 49 | 988 | 2,394 | 372 | 2,110 | 4,876 |

[1] National Oil Scouts and Landmen's Association, Oil- and Gas-Field Development in United States: 1957, vol. 27.

Digitized by Google

Average footage of new wells drilled:[11, 12]

| 1951 | 1952 | 1953 | 1954 | 1955 | [1] 1956 |
|---|---|---|---|---|---|
| 3,437 | 3,468 | 3,478 | 3,552 | 3,771 | 3,543 |

[1] World Oil, vol. 144, No. 3, February 1957, p. 124.

The ratio of success in exploratory drilling in 1956 was the same as in 1955—21 percent—although 981 exploratory wells were drilled when compared with 1,252 in 1955.

Shallow drilling in the eastern part of the State resulted in the use of a larger number of cable-tool rigs; approximately 815 rigs were used compared with 385 in 1955.[13]

**Production.**—The production of crude petroleum—124 million barrels—in 1956 was 2.5 million barrels more than was produced in 1955 and was a gain of nearly 2 percent. Barton, Ellis, Russell, Butler, Rooks, and Greenwood Counties respectively recorded the State's largest outputs.

**TABLE 13.—Production and indicated demand of crude petroleum, by months, 1956, in thousand barrels**

| Month | Production | Indicated demand | Month | Production | Indicated demand |
|---|---|---|---|---|---|
| January | 10,585 | 10,681 | August | 10,775 | 11,105 |
| February | 9,865 | 10,325 | September | 9,950 | 10,276 |
| March | 10,838 | 10,410 | October | 10,184 | 9,487 |
| April | 10,396 | 9,257 | November | 9,986 | 10,048 |
| May | 10,416 | 9,791 | December | 10,340 | 10,627 |
| June | 10,345 | 9,521 | | | |
| July | 10,524 | 10,851 | Total | 124,204 | 122,379 |

**TABLE 14.—Production of crude petroleum, 1947–51 (average) and 1952–56**

| Year | Thousand barrels | Value | | Year | Thousand barrels | Value | |
|---|---|---|---|---|---|---|---|
| | | Total (thousand dollars) | Average per barrel | | | Total (thousand dollars) | Average per barrel |
| 1947–51 (average) | 108,003 | 264,980 | $2.45 | 1954 | 119,317 | 335,280 | $2.81 |
| 1952 | 114,807 | 293,910 | 2.56 | 1955 | 121,669 | 340,670 | 2.80 |
| 1953 | 114,566 | 308,180 | 2.69 | 1956 | 124,204 | 346,529 | 2.79 |

[11] Includes oil wells, gas, and distillate wells, and dry holes only. Excludes water-input wells, gas-input wells, salt-water-disposal wells, and wells drilled deeper.
[12] American Petroleum Institute, Petroleum Facts and Figures: 12th Ed., 1956, p. 132.
[13] Work cited in footnote 9, p. 150.

Digitized by Google

**TABLE 15.—Important new oilfields discovered in 1956 [1]**

| Field | County | Initial production (barrels per day) | Field | County | Initial production (barrels per day) |
|---|---|---|---|---|---|
| Workman North | Barton | 1,696 | Unger Southwest | Marion | 3,000 |
| Snake Creek East | Clark | 360 | Advance | Sheridan | 513 |
| Warner | Decatur | 330 | Hoxie | do | 581 |
| Engel | Ellis | 596 | Rattlesnake East | Stafford | 1,393 |
| Pleasant North (revived). | do | 700 | Kindig | Thomas | 401 |
| | | | Newcomer | Trego | 3,000 |
| Brassfield | Graham | 364 | Newcomer Northwest | do | 1,642 |
| Banner South | Harper | 1,408 | | | |

[1] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas during 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub. Bull. 128, 1957, pp. 15–22.

**TABLE 16.—Production of crude petroleum, 1952–56, by fields, in thousand barrels**

[Oil and Gas Journal]

| Field | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Bemis-Shutts | 3,741 | 3,526 | 3,549 | 3,263 | 3,076 |
| Bloomer | 2,344 | 2,067 | 1,589 | 1,456 | 1,268 |
| Burnett-Southwest | 2,709 | 2,303 | 2,170 | 2,464 | 2,230 |
| Burrton-Haury | 909 | 781 | 809 | 732 | 695 |
| Chase | [1] 7,152 | [1] 6,007 | [1] 5,339 | [1] 4,897 | [1] 4,689 |
| El Dorado | 3,454 | 3,939 | 3,864 | 4,242 | 4,348 |
| Fairport | 879 | 834 | 823 | 903 | 964 |
| Geneseo-Edwards | 3,304 | 3,061 | 2,869 | 2,941 | 2,734 |
| Gladys | (2) | (2) | (2) | 1,024 | 1,885 |
| Gorham | 1,990 | 1,793 | 1,692 | 1,589 | 1,543 |
| Hall Gurney | 3,954 | 4,640 | 4,528 | 4,064 | 3,587 |
| Iuka-Carmi | 1,244 | 1,314 | 1,421 | 1,464 | 1,486 |
| Kraft-Prusa | 5,449 | 4,721 | 4,357 | 3,826 | 3,498 |
| Marcotte | 1,964 | 1,831 | 1,681 | 1,712 | 1,621 |
| Morel | 2,092 | 1,798 | 1,654 | 1,470 | 1,461 |
| Ray | 1,624 | 1,393 | 1,280 | 1,312 | 1,225 |
| Seeley-Wick | 1,292 | 1,753 | 1,798 | 1,479 | 1,341 |
| Silica-Raymond | (1) | (1) | (1) | (1) | (1) |
| Stoltenberg | 1,471 | 1,270 | 1,119 | 1,043 | 951 |
| Thrall-Augard | 1,650 | 1,121 | 1,002 | 775 | 748 |
| Trapp | 6,469 | 6,081 | 5,461 | 4,943 | 4,427 |
| Welch-Bornholdt | 740 | 1,259 | 1,361 | 1,254 | 1,108 |
| Other fields | 60,414 | [3] 63,767 | [3] 70,951 | [3] 74,816 | 78,948 |
| Total Kansas | 114,845 | [3] 115,259 | [3] 119,317 | [3] 121,669 | 123,633 |

[1] Silica included with Chase.
[2] Included with "Other fields."
[3] Bureau of Mines data.

**TABLE 17.—Barrels of oil produced, shipped in, used, and shipped out, 1955–56 [1]**

| | 1955 | 1956 | | 1955 | 1956 |
|---|---|---|---|---|---|
| Produced | 121,161,234 | 124,467,713 | Shipped out | 57,527,501 | 58,713,375 |
| Shipped in | 29,505,340 | 34,320,108 | Refined and used in Kansas | 93,139,073 | 100,074,446 |
| Total | 150,666,574 | 158,787,821 | Total | 150,666,574 | 158,787,821 |

[1] Figures provided by Conservation Division, Kansas Corporation Commission.

**Secondary Recovery.**—The recovery of oil by secondary methods increased for the third straight year and furnished 12 percent of the oil output in the State. Recovery methods included the injection of water, gas, and air. A total of 217 projects reported 6,990 producing wells and 4,302 input wells. The Cherokee and Forest City basins were the center for most of the repressuring projects.

Both fresh and brine waters were used for waterflooding; however,

Digitized by Google

brine was preferred to fresh water. The water was treated to make the chemical properties the same as that of the brine associated with oil. This was necessary to prevent "plugging" and to assure proper flow of repressuring water through the oil stratum.

**Reserves.**—Proved recoverable reserves of crude petroleum decreased 5.9 million barrels to an estimated 992 million barrels. According to the American Petroleum Institute and American Gas Association, estimated reserves of petroleum hydrocarbons, including petroleum, natural-gas liquids, and natural gas equivalent in Kansas rose to 4 billion barrels during 1956. The rate of exploratory drilling footage is increasing at a greater rate than developmental drilling footage. This increased rate has resulted in a slight increase in the rate of additions to the total hydrocarbon reserves as shown in figure 2.

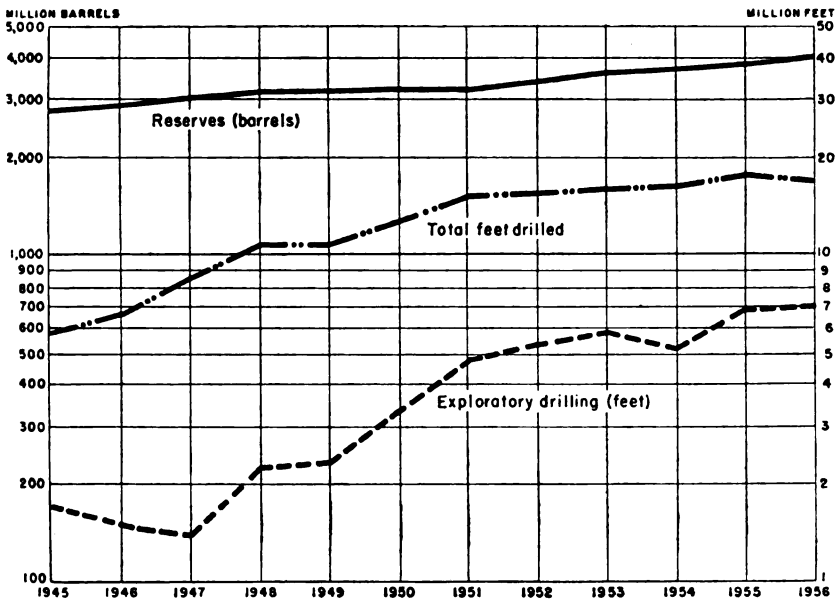



FIGURE 2.—Proved reserves of total hydrocarbons and footage drilled, 1945–56.

**TABLE 18.—Secondary recovery of oil from eight counties during 1956** [1]

| County | Number of projects | Total oil production (barrels) | Estimated secondary-recovery oil production (barrels) | Secondary recovery as a percentage of total production |
|---|---|---|---|---|
| Allen | 12 | 844,728 | 557,198 | 66.0 |
| Anderson | 7 | 658,605 | 567,688 | 86.2 |
| Butler | 29 | 8,138,153 | 4,080,185 | 50.1 |
| Franklin | 5 | 347,569 | 290,028 | 83.4 |
| Greenwood | 46 | 6,788,601 | 5,365,499 | 79.0 |
| Miami | 10 | 674,580 | 448,771 | 66.5 |
| Montgomery | 16 | 748,019 | 377,502 | 50.5 |
| Neosho | 13 | 638,149 | 490,261 | 76.8 |
| Total | 138 | 18,838,404 | 12,177,132 | 64.6 |

[1] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas during 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub. Bull. 128, 1957, p. 29.

Digitized by Google

## TABLE 19.—Capacity of petroleum refineries and cracking plants as of January 1, 1957

(Barrels per day)

| Company | Location | County | Type of plant | Crude-oil capacity | | Cracked-gasoline capacity | |
|---|---|---|---|---|---|---|---|
| | | | | Operating | Shutdown | Operating | Shutdown |
| Anderson-Prichard Oil Corp. | Arkansas City | Cowley | Skimming, cracking, and asphalt | 18,500 | | 6,800 | 1,200 |
| Century Refining Co., Inc. | Shallow Water | Scott | do. | 2,000 | 2,000 | 1,550 | 950 |
| The Chanute Refining Co. | Chanute | Neosho | do. | 1,500 | | 1,500 | |
| Cooperative Refinery Assoc | Coffeyville | Montgomery | Complete | 24,500 | | 10,420 | |
| Do. | Phillipsburg | Phillips | Skimming and cracking | 9,500 | | 2,780 | |
| Derby Refining Co. | Wichita | Sedgwick | Skimming, cracking, and asphalt | 20,000 | | 9,025 | |
| El Dorado Refining Co. | El Dorado | Butler | do. | 18,350 | | 6,300 | 2,500 |
| Mid America Refining Co., Inc. | Chanute | Neosho | Skimming and cracking | 2,100 | | 400 | |
| National Cooperative Refinery Assoc. | McPherson | McPherson | Complete | 26,000 | | 10,800 | |
| Phillips Petroleum Co. | Kansas City | Wyandotte | Skimming, cracking, lube, and asphalt | 57,000 | | 31,200 | |
| Skelly Oil Co. | El Dorado | Butler | Skimming, cracking, and asphalt | 45,000 | | 22,250 | |
| Socony Mobil Oil Co., Inc. | Augusta | do. | Complete | 35,000 | | 11,000 | |
| Standard Oil Co. (Ind.) | Neodesha | Wilson | do. | 22,500 | | 4,200 | 2,650 |
| Vickers Petroleum Co., Inc. | Potwin | Butler | Skimming and cracking | 15,000 | | 5,700 | |
| Total | | | | 296,950 | 2,000 | 123,925 | 7,300 |

Digitized by Google

## METALS

The entire production of metallic minerals originated in the Kansas portion of the Tri-State district. The national stockpile purchase program was instrumental in maintaining firm lead-zinc prices in 1956 and was partly responsible for the increased lead-zinc production in the Tri-State district. However, mine output of recoverable lead was increased as operators were able to improve the recovery of lead. The lead assay in Kansas increased 1.4 percent to 77.53 percent and permitted larger tonnages of recoverable metal. The output of lead metal increased 39 and 46 percent in tonnage and value, respectively, to 7,635 tons of lead valued at $2.4 million.

Zinc output rose to 28,665 tons valued at $7.9 million, an increase of 4 and 16 percent in tonnage and value over 1955. Cherryvale Zinc Co., reclaimers of zinc from waste products of the copper industry, was building a pilot plant to recover tin from scrap by a new process. If the project is successful, a commercial installation will be built.[14]

**TABLE 20.—Mine production of lead and zinc, 1947–51 (average), 1952–56, and total 1876–1956, in terms of concentrates and recoverable metals [1]**

| Year | Mines producing | Lead concentrate (galena) | | Zinc concentrate (sphalerite) | | Recoverable metal content [2] | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lead | | Zinc | |
| | | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 74 | 11,554 | $2,256,539 | 60,374 | $5,794,245 | 8,775 | $2,769,074 | 32,517 | $9,008,836 |
| 1952 | 84 | 7,747 | 1,582,699 | 47,077 | 5,685,236 | 5,916 | 1,904,952 | 25,482 | 8,460,024 |
| 1953 | 58 | 4,399 | 665,189 | 28,668 | 2,064,783 | 3,347 | 876,914 | 15,515 | 3,568,450 |
| 1954 | 26 | 5,390 | 916,161 | [3] 38,896 | 2,638,102 | 4,033 | 1,105,042 | [4] 19,110 | 4,127,760 |
| 1955 | 36 | 7,362 | 1,352,876 | 51,252 | 3,980,849 | 5,498 | 1,638,404 | 27,611 | 6,792,306 |
| 1956 | 41 | 10,130 | 1,955,278 | 53,142 | 4,688,130 | 7,635 | 2,397,390 | 28,665 | 7,854,210 |
| 1876–1956 | | 831,049 | 71,545,223 | 5,438,316 | 260,768,713 | 633,873 | 86,407,062 | 2,826,434 | 409,259,838 |

[1] Based on Kansas ore and old tailing treated at mills during calendar year indicated.
[2] In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal, it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of lead and zinc is calculated from the average price for all grades.
[3] Includes 360 tons from old tailing remilled.
[4] Includes 194 tons from old tailing remilled.

**TABLE 21.—Mine production of lead and zinc, by months, 1956, in terms of recoverable metals**

| Month | Lead (short tons) | Zinc (short tons) | Month | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 602 | 1,890 | August | 714 | 2,795 |
| February | 539 | 2,037 | September | 518 | 2,442 |
| March | 721 | 2,182 | October | 585 | 2,420 |
| April | 789 | 2,666 | November | 519 | 2,073 |
| May | 822 | 2,823 | December | 512 | 2,081 |
| June | 657 | 2,579 | | | |
| July | 657 | 2,677 | Total | 7,635 | 28,665 |

[14] Kansas Industrial Development Commission, To the Stars: Vol. 11, No. 2, March–April 1956, p. 23.

Digitized by Google

## NONMETALS

Nonmetal output increased approximately 12 percent over the previous year. Cement, stone, salt, and sand and gravel, in order of value, were important commodities produced.

Tight money and increased costs that sent residential building downward was offset by the increase in commercial construction and especially by public works projects. The Kansas Turnpike, the Nation's fourth longest tollroad, was estimated to cost $160 million and to require 20 years to repay.[15] Completion of this highway was expected to relieve the short supply of materials needed for other construction.

Bureau of Reclamation dedicated Webster Dam on the Solomon River near Stockton, Rooks County. The dam was to be built at a cost of $11 million and to be completed in 3 years.

**Cement.**—The Kansas cement industry was highlighted with modernization and expansions in 1956. All plants operated above capacity to supply greater demands from construction, road programs, and oil-well drilling. The State's total capacity was increased 1.3 million barrels. Shipments of masonry cement reflected a slight dip as residential construction slowed. Road construction and commercial building remained firm and reflected a gain of 12 and 19 percent, respectively, in shipments and value of cement from 1955. Most of the State shipments of cement were destined for local consumption; however, important quantities were shipped to nearby States—Missouri, Oklahoma, Iowa, Nebraska, and Arkansas. Smaller amounts were shipped to more distant States, such as Michigan, Illinois, Minnesota, and others.

**TABLE 23.—Production and shipments of portland cement, 1947–51 (average) and 1952–56, in 376-pound barrels**

| Year | Production (barrels) | Shipments | | |
|---|---|---|---|---|
| | | Barrels | Value | |
| | | | Total | Average per barrel |
| 1947–51 (average) | 8,004,240 | 7,940,534 | $16,979,805 | $2.14 |
| 1952 | 8,672,883 | 8,811,762 | 20,956,886 | 2.38 |
| 1953 | 8,766,206 | 8,546,250 | 21,428,536 | 2.51 |
| 1954 | 8,803,007 | 9,076,328 | 23,874,179 | 2.63 |
| 1955 | 9,219,533 | 9,071,747 | 24,520,533 | 2.70 |
| 1956 | 10,486,150 | 10,239,578 | 29,370,845 | 2.87 |

**Clays.**—Production and value of clays rose 14 and 8 percent, respectively, during the year as fire clay was reported for the first time since 1954. Almost all of the State production of clays was used for structural products and cement manufacture. Over 124 million unglazed brick [16] was produced during the year. A large portion of the output went to residential building.

[15] Kansas Industrial Development Commission, To the Stars: Vol. 9, No. 5, November-December 1956, pp. 10–13.
[16] Kansas Business Review, vol. 10, No. 4, April 1957.

Digitized by Google

Kansas Industries, Inc., of Kansas City, subsidiary of Texas Industries, Inc., reopened and began production in June of sintered lightweight aggregate from shale. The plant (formerly known as Mineral Products Co.) had been idle since June 1953. Kansas Industries, Inc., operated at limited production until plant modernization was completed.

Pidgeon Vitrified China Co., the only commercial dinnerware manufacturer in Kansas, shut down permanently in 1956. Water-problem and management troubles were attributed as the causes.

**TABLE 24.—Clays sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 638,073 | $524,303 | 1954 | [1] 697,832 | [1] $777,847 |
| 1952 | 665,582 | 789,293 | 1955 | [1] 767,662 | [1] 873,016 |
| 1953 | 670,694 | 749,579 | 1956 | 977,099 | 1,169,048 |

[1] Excludes certain clays, value for which is included with table 1, "Value of items that cannot be disclosed."

**Gypsum.**—Although the production of crude gypsum increased slightly from the previous year, the value was below 1955. A drop of 27 cents per ton was reported for crude gypsum during 1956. Certain-Teed Products Co. sold its Blue Rapids plant to Bestwall Gypsum Co. The plant continued to produce crude and calcined gypsum and wallboard.[17]

**Perlite.**—A small quantity of perlite was expanded at the Kansas City plant of Pencalite Perlite Co. for lightweight aggregate. It was used in non-load-bearing lightweight concrete and insulating plasters. No crude perlite was produced in Kansas.

**Pumice.**—Pumice was mined and crushed for use in ceramic pottery, abrasives, and cleansing powders. Purex Corp., Ltd., closed its two mines in 1956. As a result of this shutdown, both production and value declined 69 and 75 percent, respectively. Only two counties recorded pumice production.

**Salt.**—Sedgwick County was added to Ellsworth, Reno, and Rice Counties as a salt producer. Frontier Chemical Co., a manufacturer of salt chemicals from brine in Sedgwick County, completed a $7 million expansion program combining another abundant Kansas raw material—natural gas—to produce salt petrochemicals (organic chlorides, acetylene, and other chlorine compounds). These products, along with other abundant raw materials—petroleum and natural gas—could induce other industries to establish plants in the State.[18]

The huge agricultural industry in Kansas consumed the largest portion of rock and evaporated salt produced in the State. Meat packers, block salt for livestock, and leather tanners were among the large users of salt.

The output of salt increased 10 and 9 percent, respectively, for tonnage and value.

[17] Mining Congress Journal, vol. 43, No. 2, February 1957, p. 146.
[18] Kansas Industrial Development Commission, To the Stars: Vol. 9, No. 3, May-June, 1956, pp. 2–6.



Digitized by Google

**TABLE 25.—Salt sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Evaporated salt | | Rock salt | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 341,427 | $3,711,580 | 521,750 | $1,741,807 | 863,177 | $5,453,387 |
| 1952 | 358,887 | 4,775,741 | 552,857 | 2,074,286 | 911,744 | 6,850,027 |
| 1953 | 370,569 | 5,285,805 | 534,658 | 2,194,751 | 905,227 | 7,480,556 |
| 1954 | 356,045 | 5,474,151 | 520,622 | 2,304,255 | 876,667 | 7,778,406 |
| 1955 | 361,612 | 5,819,536 | 549,254 | 2,612,789 | 910,866 | 8,432,325 |
| 1956 | [1] 461,418 | [1] 6,352,290 | 542,624 | 2,815,074 | 1,004,042 | 9,167,364 |

[1] Includes brine.

**Sand and Gravel.**—Continued high rate of construction and road building pushed mined output and value 17 and 16 percent above 1955. Completion of the Kansas Turnpike should tend to stabilize the supply of this commodity.

Kansas reported only 176 sand and gravel operations in 1956 compared with 199 in 1955. Only 50 Government-and-contractor operators produced sand and gravel during the year. Production was reported from 68 counties. Glass, molding, blast, engine, and filter sands were other uses.

**TABLE 26.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Commercial | | Government-and-contractor | | Total sand and gravel | | |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Average value per ton |
| 1947–51 (average) | 4,754,729 | $3,000,290 | 1,861,218 | $987,099 | 6,615,947 | $3,987,389 | $0.60 |
| 1952 | 6,797,975 | 4,675,216 | 1,582,090 | 348,377 | 8,380,065 | 5,023,593 | .60 |
| 1953 | 6,678,241 | 4,946,934 | 2,050,050 | 721,374 | 8,728,291 | 5,668,308 | .65 |
| 1954 | 8,340,949 | 6,365,665 | 2,080,605 | 828,506 | 10,421,554 | 7,194,171 | .69 |
| 1955 | 9,000,242 | 6,342,242 | 1,664,744 | 567,424 | 10,664,986 | 6,909,666 | .65 |
| 1956 | 10,656,464 | 7,428,877 | 1,858,700 | 593,435 | 12,515,164 | 8,022,312 | .64 |

**Stone.**—Production of stone gained 8 percent while the value declined 2 percent compared with 1955. The decline in value reflected a lower reported value for limestone for cement. Average unit price of dimension limestone rose sharply from the previous year and bolstered the declining value. Crushed limestone represented 72 percent of the stone produced.

Southwest Chat Co. of Baxter Springs (Cherokee County) utilized tailing for crushed-stone uses from lead-zinc operations of the St. Louis Smelting & Refining Division of National Lead Co., which processes approximately 2,500 tons of ore a day.

Deposits of white marl are found in the Ogallala formation of the Tertiary in Wallace and Logan Counties.[19] In the northeastern corner of Wallace County, Delore Division of National Lead Co. of St. Louis mined diatomaceous marl. Pulverized marl was used as a flatting pigment in oil and water emulsion paints. Output of diatomaceous marl—11,710 short tons—approximated the production in 1955.

[19] Jewett, John M., and Schoewe, W. H., Kansas Mineral Resources for Wartime Industries: State Geol. Survey of Kansas, Bull. 41, 1942, part 3, pp. 134–137.

Digitized by Google

TABLE 27.—Stone sold or used by producers, 1952–56, by kinds

| Year | Limestone | | Sandstone | | Miscellaneous stone | | Total stone | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | 7, 551, 061 | $11, 204, 877 | 295, 246 | $485, 871 | 984, 564 | $360, 992 | 8, 830, 871 | $12, 051, 740 |
| 1953 | 7, 026, 871 | 10, 045, 111 | 591, 424 | 800, 008 | 1, 150, 857 | 458, 831 | 8, 769, 152 | 11, 303, 950 |
| 1954 | [1] 9, 161, 085 | [1] 11, 956, 778 | 355, 430 | 687, 180 | 860, 493 | 297, 864 | [1] 10, 377, 008 | [1] 12, 941, 822 |
| 1955 | [1] 10, 859, 729 | [1] 14, 340, 896 | 746, 414 | [1] 1, 242, 626 | 877, 237 | 362, 668 | [1] 12, 483, 380 | [1] 15, 946, 190 |
| 1956 | [2] 11, 654, 354 | [2] 14, 630, 304 | 314, 878 | 516, 242 | 1, 464, 620 | 556, 799 | 13, 433, 852 | 15, 703, 345 |

[1] Includes diatomaceous marl and limestone for cement.
[2] Includes limestone used for cement.

A new quarry was opened near Florence (Marion County) by Walt Keeler. The plant had a crushing capacity of 300 tons an hour. In addition to three sizes of aggregate, the plant produced agricultural limestone.[20]

**Vermiculite.**—Vermiculite was expanded in a plant at Wichita for insulation and as an aggregate of plaster. Production was 62 percent greater than the previous year.

**Water.**—Drought conditions throughout the Southwest focused attention to the supply and conservation of water. Water has become a vital factor to the expanding Kansas economy. The lack in programing long-range water needs of Kansas has hindered industrial growth.

Industrial consumption of water in Kansas reached 870 million gallons per day from privately developed sources. Foremost in this water consumption were the steam-electric generating plants. Three-fourths of the industrial water is used for cooling and heat exchange, but only 3½ percent of water used for industrial processes is actually consumed. The remainder was used for washing, movement of material and product, and for flushing wastes.[21]

Mineral industries of Kansas use water for cooling, processing, boiler feed, and sanitary and service purposes. Irrigation has greatly enhanced farm output. All but three counties (Elk, Woodson, and Brown) reported irrigation practices in 1956.[22] Despite this widespread application of irrigation, some Kansans consider this expenditure of water for the production of surplus crops of doubtful economic benefit.

**Conservation and Pollution.**—The major sources of industrial pollution, 65 in number, in Kansas were: Petroleum refineries (14), chemical plants (7), salt plants (4), railroads (5), major milk plants (18), meat processing (16), and miscellaneous industries. The mineral industries were responsible for approximately 25 percent of these major polluting sources.[23] Some of these industries have recognized the damages of pollution and have applied conservation measures.

The oil-producing industry, through conservation measures (salt-water disposal, etc.), made available appreciable quantities of useable water to consumers. Some pollution occurred, however, before the conservation measures were enacted. In 1955 approximately 75 percent of the brine produced in conjunction with oil was reinjected into

[20] Pit and Quarry, vol. 48, No. 11, May 1956, p. 48.
[21] Kansas State Finance Council, Water in Kansas, 1955, July 1954, p. 75.
[22] Work cited in footnote 21, p. 54.
[23] Work cited in footnote 21, pp. 108–110.

Digitized by Google

disposal wells.[24] In the recovery of oil, fresh ground-water supplies are conserved by "casing off" the well with steel pipe to prevent contamination by brine. Conservation programs by the other mineral industries would increase the availability of water in Kansas.

## REVIEW BY COUNTIES[25]

Mineral production was reported in 102 of the 105 counties in Kansas in 1956, with 55 counties reporting production valued at $1 million or more. Barton County was foremost with $41.8 million in mineral production during the year. No mineral production was reported in Greeley, Lane, and Mitchell Counties. Highway construction and building strengthened the economy of some counties. Growing production of crude petroleum was responsible for considerable gains in some county mineral values.

County road construction is included in the county review for the first time and is used to aid in measuring the mineral activity of road construction materials.

**TABLE 28.—Value of mineral production in Kansas, 1955–56, by counties[1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Allen | $10,733,745 | $11,425,963 | Cement, crude petroleum, stone, clays, natural gas. |
| Anderson | 2,224,905 | 2,043,103 | Crude petroleum, stone, sand and gravel. |
| Atchison | 384,927 | 287,725 | Stone. |
| Barber | 7,099,826 | 11,309,986 | Natural gas, crude petroleum, gypsum, natural-gas liquids, sand and gravel. |
| Barton | 40,565,367 | 41,774,952 | Crude petroleum, sand and gravel, clays, natural gas. |
| Bourbon | 1,124,214 | 1,140,544 | Natural cement, stone, crude petroleum, coal. |
| Brown | 25,059 | 23,083 | Sand and gravel, crude petroleum. |
| Butler | 24,056,370 | 23,356,706 | Crude petroleum, stone, natural gas. |
| Chase | 101,118 | 347,909 | Stone, crude petroleum, natural gas, sand and gravel. |
| Chautauqua | 2,700,610 | 2,983,774 | Crude petroleum, stone, natural gas, sand and gravel. |
| Cherokee | 11,035,808 | 13,148,802 | Zinc, lead, coal, stone, clays. |
| Cheyenne | (2) | 12,000 | Sand and gravel. |
| Clark | 1,227,626 | 1,398,307 | Crude petroleum, natural gas, sand and gravel. |
| Clay | 70,863 | (2) | Stone, sand and gravel. |
| Cloud | 341,250 | 238,400 | Clays, sand and gravel. |
| Coffey | 570,061 | 531,892 | Crude petroleum, stone, coal, natural gas, sand and gravel. |
| Comanche | 28,570 | 41,255 | Natural gas, crude petroleum, sand and gravel. |
| Cowley | 14,392,514 | 13,923,975 | Crude petroleum, stone, natural-gas liquids, sand and gravel, natural gas. |
| Crawford | 1,192,358 | 1,740,832 | Coal, crude petroleum, clays, natural gas. |
| Decatur | 978,386 | 1,097,517 | Crude petroleum, sand and gravel. |
| Dickinson | 894,956 | 737,343 | Crude petroleum, stone, sand and gravel. |
| Doniphan | 420,570 | 824,229 | Stone. |
| Douglas | 194,174 | 176,367 | Sand and gravel, stone, crude petroleum. |
| Edwards | 300,845 | 325,046 | Crude petroleum, natural gas, sand and gravel. |
| Elk | 2,506,361 | 1,994,613 | Stone, crude petroleum, natural gas, sand and gravel. |
| Ellis | 31,239,502 | 32,270,441 | Crude petroleum, sand and gravel. |
| Ellsworth | 9,399,382 | 9,200,574 | Crude petroleum, salt, sand and gravel. |
| Finney | 4,896,237 | 5,554,236 | Natural gas, crude petroleum, natural-gas liquids, sand and gravel. |
| Ford | 140,661 | 141,611 | Sand and gravel, natural gas, crude petroleum. |
| Franklin | 1,346,568 | 1,108,732 | Crude petroleum, stone, clays. |
| Geary | 363,674 | 345,700 | Stone, sand and gravel. |
| Gove | 90,082 | 76,148 | Crude petroleum, sand and gravel. |
| Graham | 13,975,460 | 16,991,280 | Crude petroleum, stone. |
| Grant | 12,583,273 | 12,889,377 | Natural gas, natural-gas liquids, sand and gravel. |
| Gray | (2) | (2) | Sand and gravel. |
| Greenwood | 18,168,147 | 18,891,267 | Crude petroleum, stone. |
| Hamilton | 633,466 | 499,827 | Natural gas, crude petroleum, sand and gravel. |

See footnotes at end of table

[24] Work cited in footnote 21, pp. 109–110.

[25] Oil and gas data taken from State published reports: Goebel, E. D., Hornbaker, A. L., Hilpman, P. L.; and Beene, D. L., Oil and Gas Developments in Kansas During 1956; State Geol. Survey of Kansas Bull. 128, 1957.

Digitized by Google

**TABLE 28.—Value of mineral production in Kansas, 1955–56, by counties [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Harper | $1,682,349 | $2,436,329 | Crude petroleum, natural gas, sand and gravel. |
| Harvey | 720,009 | 724,364 | Crude petroleum, sand and gravel, natural gas. |
| Haskell | 3,862,738 | 4,424,706 | Natural gas, natural-gas liquids, crude petroleum, sand and gravel. |
| Hodgeman | 292,562 | 335,646 | Crude petroleum. |
| Jackson | (2) | (2) | Stone. |
| Jefferson | (2) | 362,504 | Stone, crude petroleum. |
| Jewell | (2) | (2) | Stone, sand and gravel. |
| Johnson | 379,095 | 280,689 | Stone, crude petroleum, natural gas. |
| Kearny | 7,279,019 | 7,558,474 | Natural gas, natural-gas liquids, crude petroleum, sand and gravel. |
| Kingman | 4,990,367 | 6,457,401 | Crude petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Kiowa | 185,393 | 738,803 | Crude petroleum, natural gas, sand and gravel. |
| Labette | 582,461 | 371,448 | Crude petroleum, stone, natural gas. |
| Leavenworth | 560,719 | 931,084 | Stone, sand and gravel, clays, crude petroleum, natural gas. |
| Lincoln | (2) | (2) | Stone, pumicite. |
| Linn | 405,071 | 403,144 | Crude petroleum, stone, sand and gravel, natural gas. |
| Logan | (2) | 45,208 | Sand and gravel. |
| Lyon | 1,320,964 | 1,158,196 | Crude petroleum, sand and gravel, stone. |
| Marion | 2,935,554 | 4,062,554 | Crude petroleum, stone, natural gas. |
| Marshall | 619,766 | 650,740 | Gypsum, sand and gravel. |
| McPherson | 12,470,355 | 11,065,845 | Crude petroleum, natural gas, sand and gravel. |
| Meade | 1,660,734 | 2,170,662 | Crude petroleum, natural gas. |
| Miami | 2,048,120 | 2,049,376 | Crude petroleum, stone, natural gas. |
| Montgomery | 9,263,885 | 8,179,238 | Cement, crude petroleum, natural gas, clays, stone. |
| Morris | 220,733 | 846,601 | Crude petroleum, stone, sand and gravel, natural gas. |
| Morton | 7,101,891 | 9,040,467 | Natural gas, crude petroleum. |
| Nemaha | 90,208 | 116,696 | Crude petroleum, stone. |
| Neosho | 6,866,771 | 6,859,458 | Cement, crude petroleum, stone, natural gas. |
| Ness | 998,309 | 1,348,779 | Crude petroleum. |
| Norton | 2,910,576 | 2,568,484 | Crude petroleum, pumicite. |
| Osage | (2) | 356,002 | Stone, coal. |
| Osborne | 241,951 | 246,277 | Crude petroleum, sand and gravel. |
| Ottawa | (2) | 14,715 | Sand and gravel. |
| Pawnee | 7,261,478 | 10,063,216 | Crude petroleum, natural gas, sand and gravel. |
| Phillips | 5,963,815 | 5,115,976 | Crude petroleum. |
| Pottawatomie | 136,712 | 169,540 | Stone, sand and gravel. |
| Pratt | 8,232,256 | 7,927,276 | Crude petroleum, natural gas, sand and gravel. |
| Rawlins | ---------- | 2,511 | Crude petroleum. |
| Reno | 10,075,846 | 9,679,369 | Salt, crude petroleum, natural-gas liquids, sand and gravel, natural gas. |
| Republic | (2) | (2) | Sand and gravel. |
| Rice | 20,993,506 | 17,068,726 | Crude petroleum, salt, sand and gravel, stone, natural gas. |
| Riley | 132,900 | 160,449 | Sand and gravel, stone. |
| Rooks | 19,888,555 | 19,409,806 | Crude petroleum. |
| Rush | 2,174,739 | 2,999,145 | Crude petroleum, helium, natural gas, natural-gas liquids. |
| Russell | 30,126,873 | 27,460,550 | Crude petroleum, sand and gravel, natural gas. |
| Saline | 3,591,176 | 2,565,077 | Crude petroleum, sand and gravel. |
| Scott | 282,894 | 205,519 | Do. |
| Sedgwick | 9,042,225 | 11,012,401 | Crude petroleum, sand and gravel, natural-gas liquids, natural gas, salt. |
| Seward | 5,171,118 | 5,171,677 | Natural gas, natural-gas liquids, crude petroleum |
| Shawnee | 1,004,964 | 1,078,084 | Stone, sand and gravel. |
| Sheridan | 1,066,801 | 1,155,456 | Crude petroleum, sand and gravel. |
| Sherman | 30,314 | 44,972 | Sand and gravel. |
| Smith | (2) | 1,701 | Do. |
| Stafford | 18,464,346 | 17,450,385 | Crude petroleum, natural gas, sand and gravel.. |
| Stanton | 1,738,380 | 1,872,891 | Natural gas, sand and gravel, crude petroleum. |
| Stevens | 12,214,872 | 11,230,119 | Natural gas. |
| Sumner | 8,064,466 | 8,885,627 | Crude petroleum, natural gas, sand and gravel. |
| Thomas | 36,568 | 69,297 | Sand and gravel, crude petroleum. |
| Trego | 3,032,586 | 4,112,152 | Crude petroleum, sand and gravel. |
| Wabaunsee | 441,837 | 923,399 | Do. |
| Wallace | (2) | 40,487 | Diatomaceous marl, sand and gravel. |
| Washington | (2) | 63,950 | Sand and gravel. |
| Wichita | ---------- | 30,446 | Do. |
| Wilson | 3,754,058 | 6,127,749 | Cement, stone, crude petroleum, clays, natural gas, salt. |
| Woodson | 2,414,934 | 2,795,988 | Crude petroleum, natural gas. |
| Wyandotte | 7,392,610 | 9,318,822 | Cement, stone, sand and gravel, natural gas. |
| Undistributed | 2,551,901 | 4,436,831 | |
| Total | 470,830,000 | 493,307,000 | |

[1] The following counties are not listed, because no production was reported: Greeley, Lane, and Mitchell.
[2] Value included with "Undistributed."

Digitized by Google

**Allen.**—Production and shipments of both masonry and portland cements, by Lehigh Portland Cement Co., at Iola, and Monarch Cement Co., at Humboldt, were the largest in Kansas during 1956. Monarch Cement Co. began a $6.5 million expansion of its facilities.[26]

Over 800,000 barrels of crude petroleum was recovered from 10 fields and 12 secondary-recovery projects accounted for 66 percent of this total. Of an estimated 333 wells drilled for primary, secondary, and natural-gas recovery, 227 were oil productive. Natural gas was produced from the Humboldt-Chanute field.

Limestone was crushed by Monarch Cement Co., Nelson Bros. Quarries, and by the Allen County Highway Department for concrete, road metal, and screening purposes. A small quantity of agricultural limestone was crushed. The United Brick & Tile Co., at Iola, and Humboldt Brick & Tile Co., near Humboldt, mined clay for the manufacture of brick and tile.

**Anderson.**—Secondary recovery of oil yielded over 86 percent of the total petroleum for Anderson County and was responsible for most of the drilling activity during 1956. Nearly 700,000 barrels of crude oil was produced from 21 areas in 8 fields. Production declined from previous year. An estimated total of 116 wells was drilled during the year.

At Garnett, crushed limestone was produced for concrete and road metal by the Garnett Rock Co. Paving gravel was quarried by the Anderson County Highway Department for road construction. Nelson Bros. Quarries crushed limestone near Mount Ida for concrete and road metal.

**Barber.**—Over 1.9 million barrels of crude petroleum was produced from 51 fields in Barber County. Most of the production was by primary methods, as only two secondary recovery projects were reported. Drilling activity increased 7 percent from the previous year with a total of 217 wells drilled in 1956. Exploration and development activities were concentrated mainly in the Rhodes and Hardtner fields. New oil and gas fields numbered 14, of which 10 were new Mississippian gas fields, the more important of which were the Driftwood and Elsea gas fields. Highway and Platt oil fields were important discoveries. Rhodes, the largest oil field in Barber County, produced 900,000 barrels; however, much of the field was shut in during early months of the year because of no market. Output of natural gas from Barber County was over 50 billion cubic feet during 1956. Natural gasoline was recovered by Kansas Power & Light Co. at its plant near Medicine Lodge.

Mined tonnage of crude gypsum was about the same as last year; however, value declined sharply. Paving gravel was quarried by Barber County Highway Department.

**Barton.**—The 1956 value of mineral production from Barton County, composed mostly of petroleum, was the largest in the State. Nearly 15 million barrels of crude oil was recovered from 153 fields, which was 6 percent more than the previous year. Of 273 wells drilled in 1956, 130 were oil, 3 gas, and 19 dry wildcats. The remainder of the wells drilled were dry development wells or service wells. Workman North, St. Peter East, and Klug West, each pro-

[26] Pit and Quarry, vol. 49, No. 7, January 1957, p. 153.

Digitized by Google

ducing from the Lansing-Kansas City strata, were important new oilfield discoveries.

Over 600 million cubic feet of natural gas was recovered from the Heizer Southwest, Krier, Pawnee Rock, and Unruh fields. Production of natural gas declined from the previous year.

Arkansas Sand & Gravel Co., Dubois Sand Co., Gruber Sand Plant, Moos Bros. Sand Co., and the Barton County Highway Department quarried sand and gravel for paving and construction purposes. Most all of this tonnage was reported as sand. Barton Brick & Tile Co. produced structural products from its new Hoisington plant. Great Bend Brick & Tile Co. mined fire clay for face brick and other structural clay products.

**Bourbon.**—Fort Scott Hydraulic Cement Co. produced natural cement, the leading commodity in the county. Shipments increased from 1955. Dimension sandstone was quarried by Bandera Stone Quarry at its plant near Fort Scott. Cullor Limestone Co., Fort Scott Hydraulic Cement Co., and the Bourbon County Highway Department quarried and crushed limestone for road construction, riprap, and agricultural purposes.

Three coal mines were operated in Bourbon County during the year; output declined 35 percent from 1955. A small quantity of crude oil was produced.

**Butler.**—Butler County ranked fourth in the total value of mineral production and in the value of petroleum in Kansas. The value of the 8 million barrels of crude petroleum produced from 65 fields was $23.3 million, 97 percent of the total county mineral value. Secondary-recovery operations accounted for half of the petroleum produced in the county. Wells drilled in the county during the year totaled 269 and 2 new oil fields were discovered. A small quantity of casinghead gas was recovered.

The following companies were expanding oil-refining facilities in the county:[27]

| Company | Unit | Capacity barrels/day |
|---|---|---|
| American Oil Co | Ultraformer | 6,120 |
| Do | Hydrodesulfurization | 12,000 |
| Skelly Oil Co | H–F Alkylation | 3,500 |
| Socony Mobil Oil Co | Catalytic reformer | 9,000 |
| Vickers Petroleum Co., Inc | Ultraformer | 3,500 |

Limestone used for road construction, building purposes, and agricultural limestone was crushed by the Amis Construction Co. of Augusta and George M. Myers, Inc., with two plants, Seglem and Duvanel.

**Chautauqua.**—Petroleum production in Chautauqua County increased 9 percent to over a million barrels. Production by waterflooding dropped from 75 percent of the petroleum recovered in 1955 to 54 percent in 1956. Approximately 268 wells were drilled during the year—181 less than in 1955—and most of this activity was concentrated on secondary-recovery projects. Natural gas was produced from several fields.

Sedan Limestone Co. of Sedan crushed limestone for building and paving purposes. Gravel used for paving was quarried by the Chautauqua County Highway Department.

[27] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, pp. 198–202

Digitized by Google

**Cherokee.**—The State's entire production of lead and zinc originated in Cherokee County. Twenty-nine mining companies operated 45 mines in the county. The 2 largest producers were The National Lead Co., St. Louis Smelting & Refining Division (7 mines), and Eagle-Picher Co. (7 mines). The Eagle-Picher Co. operated its lead smelter and pigment plant and produced sulfuric acid by the contact process at Galena.

The county remained first in coal mined in Kansas, and output increased 4 percent from 1955. Only 6 strip mines—2 less than last year—operated during the year and provided employment for 171 men. Important coal producers in the county were: Pittsburgh-Midway Coal Co. at Hallowell, and Wilkinson Coal Co. at Weir.

Three new companies joined Baxter Chat Co. and Eagle-Picher Co. in the utilization of lead-zinc tailings for stone use; C. Y. Semple, Southwest Chat Co., and Southwest Rock & Chat Co. Chats were produced by the Baxter Chat Co. and Eagle-Picher Co. for railroad ballast, concrete, and road metal. Miscellaneous clay was stripped for the manufacture of structural clay products by the United Brick & Tile Co. at Weir.

**Clark.**—The Harper Ranch field in Clark County was mainly responsible for over a 14-percent gain in the county's production of petroleum in 1956. Crude petroleum and natural gas were produced from eight fields in the county. Clark County Highway Department mined gravel for paving purposes.

**Cloud.**—Earl Beaver Sand Co. at Glasco, Ross Sand Co., Inc., and Walker Sand Co. near Concordia quarried sand and gravel for building and paving purposes. Plastic fire clays were mined at Concordia for use in face brick and other structural products by Cloud Ceramics.

**Coffey.**—Crude-petroleum recovery declined to 161,000 barrels from 190,000 barrels, but it remained the leading mineral produced in the county. One new field—Crandall—was discovered from 28 wells drilled during the year. Coal production declined for the second straight year and was 30 percent less than in 1955. Coal was produced by S. L. Rogers Coal Co. at Arvonia, and the Thorne Coal Co. at Lebo.

Neosho Valley Rock Co., near Burlington, and Jones Rock Co., near Emporia, crushed limestone for concrete, road metal, and agricultural uses. Paving gravel was produced by Coffey County Highway Department. Natural gas was recovered.

**Cowley.**—Cowley County ranked 10th in the State for value of mineral production in 1956. Crude petroleum—the leading mineral commodity—declined 100,000 barrels to 4.6 million barrels reported from 98 fields. Eleven new fields were discovered in 1956, and 202 development oil wells and 5 gas wells were found from 367 wells drilled. Secondary recovery of oil is growing in importance as an additional 260,000 barrels brought the total to 900,000 barrels. Anderson-Prichard Oil Corp. was increasing its crude capacity by 6,500 barrels per day and its straight-run asphalt capacity 250 barrels per day at the Arkansas City refinery.[28] The Texas Co. recovered natural gasoline and LP-gases at its plant near Burden. The half billion cubic feet of natural gas recovered approximated the output of the year.

[28] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 198.

Digitized by Google

Crushed limestone was produced by Anderson-Oxandale at Udall, and John V. Elam at Winfield, for riprap, concrete, and road metal. Dimension limestone was produced at Silverdale by Silverdale Cut Stone and Silverdale Limestone.

Sand and gravel was quarried for structural and paving uses by Cowley County Highway Department at Winfield; Arkansas City Sand & Gravel Co., McFarland Gravel Co., George M. Myers, Inc., and Wilson Bros., all of Arkansas City; Phillips & Son Construction, Winfield Sand & Gravel Co., both of Winfield; and Oxford Sand & Gravel Co. at Oxford. Blast, filter, railroad-ballast, and engine sands also were produced.

**Crawford.**—The mined tonnage of coal from Crawford County was second only to that produced in Cherokee County. Coal was mined by two methods: Shaft and open pit. Lucky Star Coal Co. (Pittsburg) and Blue Ribbon Coal Co. (Girard) operated shaft mines. Important producers among 12 strip mines in the county were the Apex-Compton Coal Co. at McCune and Clemens Coal Co. near Pittsburg. Sixty-four persons were employed by the underground coal operators and 162 men by open-pit operators.

A small quantity of crude petroleum was produced from 6 fields in Crawford County and secondary recovery represented 82 percent of the total 49,000 barrel production. Natural gas also was recovered in the county.

W. S. Dickey Clay Manufacturing Co. mined miscellaneous clay and fire clay for the manufacture of face brick, building brick, building tile, and other structural products.

**Decatur.**—Production of crude petroleum from 10 fields was nearly 400,000 barrels—an increase of 13 percent from 1955. Three new fields, Van Fleet, Warner, and Warner North were discovered and the Warner field recorded an initial potential of 330 barrels per day.

Sand for paving purposes was produced by the Decatur County Highway Department at Oberlin.

**Dickinson.**—Limestone was quarried from 3 pits by Anderson-Oxandale and from 1 pit by Riddle Quarries, Inc., for building, paving, and agricultural limestone. Sand and gravel was produced for paving and building by Shoffner Sand & Gravel Co. near Solomon, and by C. Smith Sand & Gravel Co. near Abilene.

Recovery of crude petroleum from 7 fields in Dickinson County was approximately 127,000 barrels. One new field—Bonaccord Northeast—was discovered from 23 wells drilled.

**Doniphan.**—Limestone was crushed by Everett Quarries, Inc., at Wathena; George W. Kerford Quarry, Inc., at Sparks, Wolf River, and Iowa Point; Wolf River Limestone, Inc., at Troy; and by the United States Corps of Engineers. The material was used mainly for riprap, concrete, roadstone, and agricultural limestone.

**Edwards.**—Petroleum and natural gas were recovered from 14 fields in Edwards County. Production of natural gas increased 89 percent over that of 1955 to 727 million cubic feet.

Sand and gravel was produced by Dave Showalter at Kinsley for paving and road maintenance.

**Elk.**—Production of stone in Elk County ranked second in the State for 1956. Limestone was quarried and crushed by Concrete Materials Construction Co. near Moline and by Elk County Highway

Digitized by Google

Department near Howard, for concrete, road metal, railroad ballast, agricultural limestone, and riprap. Gravel for paving and road maintenance was mined by the Elk County Highway Department.

Production of crude oil declined slightly from the previous year. Only 1 new oil field was discovered, and drilling activity declined to a total of 91 wells. Crude-petroleum production was recorded in Elk County as early as 1920. Natural gas was produced from some of the 30 fields in the county.

**Ellis.**—Ellis County ranked second in the State in value of mineral production and second among the oil-producing counties, with over $32 million for petroleum in 1956. Over 11.6 million barrels of petroleum was produced from 112 fields. Sixteen new oil fields were discovered, of which the Engel (with an initial potential of 596 barrels per day) and the North (with an initial potential of 202 barrels per day) were important. Three oil fields—Dechant, Pleasant North, and Richards—were revived. One hundred sixty-seven oil wells were productive among 332 wells drilled in 1956.

A small quantity of building sand was produced near Victoria by Lewis C. Schmidtberger.

**Ellsworth.**—The 1956 production of oil (3 million barrels from 18 fields) declined for the third straight year. Drilling activity, resulting in 1 oilfield discovery, also declined, as only 60 wells—9 less than in 1955—were drilled.

Rock salt was produced near Kanopolis by the Independent Salt Co. Much of the salt was consumed by the agricultural and chemical industries. Paving sand was quarried by the Ellsworth County Highway Department and Henry Millberger near Wilson.

**Finney.**—The Finney County portion of the Hugoton gas area produced 38 billion cubic feet of natural gas, 12 percent more than the record year of 1955. Drilling in the county resulted in 49 new gas wells and 11 new oil wells from 69 drilled wells. Discovery wells of the 2 new fields, Pleasant Prairie NW. and Sequoyah, each had an initial potential, 200 and 177 barrels of oil per day, respectively. Eight wildcat tests were attempted during 1956, and all proved dry. Oil and gas production originated from 10 fields. Northern Natural Gas Co. recovered natural gasoline at its plant near Holcomb.

Sam Alsop Construction Co., Smith Sand Co., and Finney County Highway Department, all of Garden City, produced sand and gravel for building and paving.

**Franklin.**—Secondary-recovery projects yielded 84 percent of the 348,000 barrels of petroleum produced in 1956. The quantity of oil recovered from the 5 fields in the county was considerably less than the 377,000 barrels of petroleum recovered in 1955.

Crushed limestone was produced by Anderson-Oxandale, Dan Fogle, and Solomon Construction Co. Lightweight aggregate was expanded by the Haydite process by Buildex, Inc. Miscellaneous clay, mined near Ottawa, was the raw material used for making lightweight aggregate.

**Geary.**—Crushed and dimension limestone was quarried by the Walker Cut Stone Co. near Junction City. Grosshans and Petersen quarried and crushed limestone for concrete and road aggregate. Building and paving sand was produced by Junction City Sand & Gravel Co. and by More Sand Co. near Junction City.

Digitized by Google

**Graham.**—Graham County ranked ninth in the State in value of mineral production; most of this value resulted from the production of crude petroleum. Forty-eight fields produced over 6 million barrels of oil. Exploration and drilling activity declined from 1955 with most of the activity concentrated in the Holley and Cooper fields. Four new oilfields were discovered and 1 (Brassfield) reported over 300 barrels per day initial production.

Government-and-contractor operators crushed sandstone for riprap.

**Grant.**—Grant County ranked second in the State in production of natural gas with a total of 77 billion cubic feet produced from 572 Hugoton-gas-area wells, a decline of 8 percent in production from 1955. Only two new gas wells were drilled during the year. The county was first among natural-gasoline and liquefied-petroleum producing counties, with a value of $4.4 million.

**Greenwood.**—Secondary-recovery projects yielded 79 percent of the 6.8 million barrels of oil produced from 50 fields in the county. Two hundred forty-six wells, including oil wells, dry holes, input wells, and salt-water-disposal wells, were drilled during the year. Nearly all drilling was for development of secondary-recovery projects. Mignot field was discovered, and four dry wildcats were drilled. Forty-nine waterflooding and other secondary-recovery operations were reported.

Greenwood County Highway Department crews crushed limestone for paving purposes.

**Hamilton.**—Natural gas was the leading commodity produced in Hamilton County. Production in 2 fields yielded over 4.3 billion cubic feet of natural gas and a small quantity of petroleum. Gas output decreased 17 percent to 4.3 million cubic feet, and oil recovery declined 37 percent (6,000 barrels) from 1955.

Building sand, paving sand, and paving gravel were produced near Syracuse by Smith Sand & Gravel Co., Syracuse Sand & Gravel Co., and the Hamilton County Highway Department.

**Harper.**—The impact of oil can easily be measured in Harper County, as the total mineral value ($1.7 million) experienced a sharp rise of 45 percent over the record year of 1955. Virtually all of this increase was attributable to the mounting crude-petroleum production in the county. Recovery of oil grew 39 percent and originated from 7 fields. Three new fields were discovered from 59 wells drilled, which were less than half of the number of wells drilled in the previous year. The discovery well of the Banner South field reported an initial potential of 1,408 barrels per day and Sunny View South recorded 35 barrels per day. Unfortunately, the Wildcat Creek field discovery yielded no oil and was abandoned. Developmental drilling resulted in 24 oil wells, 2 gas wells, and 7 oil and gas wells. Natural-gas recovery supplied the remainder of the increased mineral value. Production of natural gas (2.6 billion cubic feet valued at $285,000) more than doubled the 1955 output.

Paving sand was produced by the Harper County Highway Department.

**Harvey.**—Petroleum production in Harvey County increased slightly from the previous year. Natural gas output gained 19 percent over last year. Oil and natural gas were recovered from 10 fields in the county. Two new fields, Burrton East (oil) and Burrton North (gas), were discovered.

Digitized by Google

Building and paving sands were quarried near Burrton by Howard R. Thach.

**Haskell.**—The Haskell County section of the Hugoton gas area reported over 31.4 billion cubic feet of natural gas. Nineteen new gas wells were drilled in the development of the Hugoton area. Pleasant Prairie field—the only oilfield in Haskell County—increased its output to 121,000 barrels, a rise in production of 87 percent from 1955.

Howard Mitchell produced building sand near Hugoton.

**Kearny.**—Approximately 63.5 billion cubic feet of natural gas valued at approximately $7 million was reported in 1956. Twenty-six development wells were drilled, principally for natural gas, in the west-central part of the county. One new oilfield (South Side) was discovered from 33 wells drilled; this was the second oilfield in the county. Kansas-Nebraska Natural Gas Co., with its plant near Deerfield, and Colorado Interstate Gas Co., Inc., with its plant near Lakin, recovered natural gasoline and liquefied petroleum gases.

Paving sand was produced for the Kearny County Highway Department. Building and paving sand was quarried near Ulysses by Glen Popejoy.

**Kingman.**—Crude petroleum produced from 25 fields in Kingman County was nearly 2 million barrels and represented a 33-percent increase from the record output of 1955. Drilling activity accounted for 142 wells and 3 new field discoveries; however, the Georgia Spur field was abandoned. Natural-gas liquids were produced by the Skelly Oil Co. at its plant near Cunningham.

Recovery of natural gas more than tripled that in 1955. Two gas-field discoveries were Goetz and Settle, which logged an initial potential of 24 and 2.4 million cubic feet of natural gas per day, respectively. Natural-gas production in Kingman County was 6.9 billion cubic feet.

Building gravel was produced by Ray Wells from his quarry near Kingman.

**Labette.**—Limestone was produced by the Labette County Highway Department at Oswego, for concrete, road metal, and building rubble. Over 100,000 barrels of petroleum was produced from 10 fields. Waterflooding and gas repressuring represented a third of the total production. Fifty-seven wells were drilled, of which 22 were oil productive, 19 dry, and 16 were for repressuring old fields. Gas recovery of 91 million cubic feet declined approximately 10 million cubic feet from that of the previous year.

**Leavenworth.**—Limestone was crushed for riprap, concrete, road-metal aggregate, railroad ballast, and agricultural limestone by Wyandotte County Engineers, Loring Quarries, Inc. (near Coldspur), George W. Kerford (near Lowemont), Kansas State Penitentiary at Leavenworth, and the City of Leavenworth. Building and paving sands were produced by the Missouri Valley Sand, Inc., and Inland Construction Co. Natural gas and crude petroleum were produced during the year.

**Linn.**—The value of minerals produced dropped for the second straight year but was only slightly lower than in 1955. Waterflood projects in Linn County accounted for nearly all of the crude petroleum produced from the county's six fields, and the recovery was

Digitized by Google

slightly more than in the previous year. Drilling of 54 wells in 1956 was less than the estimated 43 drilled in 1955.

Concrete and road aggregate and agricultural limestone were crushed by Lee Giles near Greeley and by Murray Limestone Products Co. near Centerville. Paving gravel was stripped by the Linn County Highway Department.

**Lyon.**—Production of petroleum in Lyon County originated from 8 fields and amounted to 350,000 barrels. Waterflooding accounted for over 130,000 barrels of this production. Drilling activity in the county declined to 24 wells drilled, with most of the activity concencentrated in Fankhouser field, where 14 wells were drilled.

Sand and gravel was produced from quarries near Hartford by Wesley Parks and near Emporia by Harry Waterman, for building and paving purposes. A small quantity of limestone for concrete aggregate and roadstone was produced by Anderson-Oxandale near Bushong.

**Marion.**—Approximately 1.4 million barrels of crude petroleum was recovered from 32 fields in the county. Drilling activity was high in Marion County, as 270 wells were drilled and 7 new fields discovered. Unger Southwest was an important discovery and also accounted for the drilling of 84 wells. Natural-gas recovery increased slightly from 1955.

Riddle Quarries, Inc., operated 2 crushing plants—1 at Lost Springs and 1 at Marion—for the production of crushed limestone used for riprap, railroad ballast, concrete, roadstone, and screenings.

**Marshall.**—Bestwall Gypsum Co. purchased the Blue Rapids plant from Certain-Teed Products Corp. Mined output of gypsum increased slightly from 1955. Building and paving sand and gravel were produced by the Blue River Sand & Gravel Co. at Blue Rapids, by C. V. Garrett at Blue Rapids, by Hall Bros. at Marysville, by the Heinzelman Construction Co. at Marysville, and by Hugo P. Vogler at Waterville. A small quantity of filter gravel was produced.

**McPherson.**—Crude petroleum (valued at $11 million) was the leading mineral produced in McPherson County. Almost 4 million barrels of crude petroleum was recovered from 38 fields. The number of wells drilled in McPherson County declined from 149 in the previous year to 147. This drilling activity resulted in the discovery of two new fields—the Round Hill and the Harmac East. Cooperative Refinery Association operated its petroleum refinery near McPherson.

Paving gravel was produced by McPherson County Highway Department.

**Meade.**—The recovery of petroleum (490,000 barrels) exceeded that in 1955. Drilling activity rose sharply from 1955 as 62 wells were completed. Six new fields (1 oil and 5 gas) were found as a result of increased exploration. Most important of the 6 fields discovered in 1956 was the Fincham gasfield, with an initial potential of 30 million cubic feet of gas. Natural-gas recovery (over 7 billion cubic feet) rose 155 percent from the previous year and discovery of the Fincham, Sanders, Plains, Horace, and Angell fields will make Meade an important gas-producing county.

Purex Corp., Ltd., closed its pumicite mines indefinitely.

**Miami.**—Crude petroleum was the leading mineral commodity reported in Miami County for 1956, and all production was from

Digitized by Google

35 areas in 5 fields. Ten waterflood projects accounted for 67 percent of the 675,000 barrels recovered. Drilling of 285 wells resulted in 148 oil producers, 2 gas producers, 60 dry holes, and 75 were for repressuring. A small quantity of natural gas was reported.

Limestone for concrete, road metal, and agricultural purposes was produced by L. W. Hayes, Inc., and the Miami County Highway Department near Paola.

**Montgomery.**—Montgomery County was second in the State in the output of cement. The entire output of portland and masonry cements was produced at the Independence plant of Universal Atlas Cement Co. The crushing, storage, and drying equipment of the Independence plant was modernized and improved with no increase in capacity.

Production of crude petroleum declined 85,000 to 748,000 barrels and was produced from 10 fields. Half of this production originated from 16 waterflood projects. Most of the 320 wells drilled were for development of waterflood projects; however, 3 dry wildcats were drilled. Natural gas was produced in the county.

Structural clay products were manufactured from miscellaneous clay at Coffeyville by the United Brick & Tile Co.; Ludowici-Celadon Co. manufactured floor and wall tile at its Coffeyville plant. Concrete aggregate and road metal were produced by Anderson-Oxandale at the James Quarry and Severs Quarry near Sycamore.

Ozark Smelting & Mining Co. processed zinc ores into zinc pigment at its Coffeyville plant.

**Morton.**—Only two mineral commodities were reported in Morton County—natural gas and petroleum. The recovery of natural gas increased approximately 22 percent to over 73 billion cubic feet in 1956. Of the 114 wells drilled during the year, 65 were gas, 29 were development oil wells, and 1 was a dry wildcat. The remainder of wells drilled were dry development wells or service wells. The recovery of natural gas originated from two areas—Greenwood gas-field and Hugoton gas area. The 346,000 barrels of petroleum recovered more than doubled the 1955 output.

**Neosho.**—Cement was the county's leading mineral commodity in 1956. Ash Grove Portland Cement Co. completed revamping its plant. Shipments declined from the previous year.

The quantity of crude petroleum—638,000 barrels—produced from 8 fields in Neosho County was slightly less than the previous year. Secondary-recovery operations supplied nearly 77 percent of total oil recovered. An estimated 335 wells were drilled in 1956. Chanute Refining Co. and N. F. A. Oil Co. operated petroleum refineries near Chanute. Natural gas was recovered in the county.

Harry Byers and Joe O'Brien crushed limestone for concrete, road metal, and agricultural limestone. The Neosho County engineer quarried limestone for concrete and road metal near Urbana. Harry Byers quarried a small quantity of limestone rubble.

**Ness.**—The 486,000 barrels of crude petroleum produced from 12 fields in Ness County increased 37 percent for the second straight year. Five new fields were discovered, of which the Ryersee was an important discovery. Petroleum was the only mineral commodity reported in 1956.

Digitized by Google

**Norton.**—The 1956 production of crude petroleum from Norton County decreased 11 percent from over 1 million to 900,000 barrels. Exploration and development involved 21 wells and included 15 dry wildcats. This was approximately half the number of wells drilled in 1955.

Pumicite was prepared by the Wyandotte Chemical Corp. at Calvert.

**Pawnee.**—Approximately 3.4 million barrels of crude petroleum was produced from 39 fields in Pawnee County, representing a gain of about 43 percent over 1955. Drilling of 175 wells resulted in 5 new field discoveries. The Larned Southwest oilfield and Evers South gasfield were important discoveries. Natural-gas recovery (4.6 billion cubic feet) declined from the preceding year.

Paving gravel was produced by the Pawnee County Highway Department. Sand and gravel for building, paving, and other purposes was produced by Johnson Sand-Gravel Co. and Larned Sand & Gravel Co.

**Phillips.**—The value of petroleum produced in Phillips County—$5.1 million—declined approximately 13 percent from the preceding year. This was the second year in which production declined. Fourteen wells were drilled, of which 7 were oil-productive and 7 were dry. The petroleum refinery of the Cooperative Refinery Association was operated at Phillipsburg. Crude petroleum was the only mineral reported in the county.

**Pratt.**—Yield of crude petroleum, produced from 40 fields including 1 secondary-recovery project, was 2.8 million barrels. Two new oil fields and 1 new oil and gas field were discovered in the county by the drilling of 39 wells in 1956. Two new oil fields were Carver-Robbins and Haskins; the oil and gas field was the Cullison. Natural-gas production was over 1.3 billion cubic feet.

Near Pratt, C. D. Hogard and the Pratt County Highway Department produced paving sand; Miller Sand & Gravel Co. mined building sand.

**Reno.** —The value of salt—$6 million—from Reno County was the largest of the 3 counties reporting salt, and this value increased 3 percent from 1955. Salt was evaporated by Barton Salt Co., Morton Salt Co., and Carey Salt Co.; rock salt was mined by the Carey Salt Co. All salt was produced near Hutchinson.

The production of crude petroleum from 21 fields in the county was over 1 million barrels. This output declined slightly from the previous year. Drilling of 42 wells resulted in 3 oil and 39 dry holes. Natural-gas liquids were recovered near Burrton by the Cities Service Oil Co. Natural-gas yield continued to rise, and the 1956 production of 476 million cubic feet was 5 percent greater than in 1955.

J. N. Shears' Sons, Inc., produced building and paving sand from its pit near Hutchinson. Building sand was stripped by the J. E. Steele Sand & Gravel Co. near Hutchinson. Sand and gravel was produced by Fountain Sand Pit near Arlington, Haven Sand Co. near Haven, and J. A. Mummy near Nickerson for building and paving purposes and glass sand.

**Rice.**—Rice County yield of crude petroleum was 5.4 million barrels from 60 fields. The recovery of oil diminished 21 percent from 1955.

Digitized by Google

Drilling of 144 wells resulted in the discovery of 3 new fields—Bredfelt, Orth North, and Humphreys. Approximately 804 million cubic feet of natural gas were produced in the county.

Both evaporated and rock salt was produced near Lyons by the American Salt Corp.

Sand and gravel for structural and paving purposes was mined by Arensman Sand & Gravel Co. near Raymond; A. L. Stapleton near Alden; Rock Hill Stone & Gravel Co. and Sterling Sand & Gravel Co., both near Sterling; and A. Wright & D. Birchenough near Lyons. Riddle Quarries, Inc., crushed limestone near Little River for riprap, concrete, roadstone, and agricultural purposes.

**Rooks.**—Crude-petroleum production (the only mineral commodity reported in Rooks County) ranked fifth in the State. Recovery of 7 million barrels was from 79 fields. Exploratory drilling resulted in the discovery of 5 new fields, which were: Annon South, Cresson, Gra-Rook North, Trarback, and Williams North. The discovery well of the Gra-Rook North field had an initial potential of 281 barrels of oil per day. Drilling accounted for 73 new oil wells from 159 wells drilled. Important producing fields included Marcotte, Barry Southeast, Jelinek, Northampton, and Palco Southeast.

**Rush.**—Petroleum recovery jumped 75 percent to 703,000 barrels and was from 16 fields. Four new fields were discovered from 61 wells drilled during the year. These were Pechanec, Ryan West, and Web Southwest oilfields and Lohrey gasfield. The yield of helium, recovered from natural gas by the Federal Bureau of Mines plant at Otis, increased from the previous year. Production of natural gas, over 2.5 billion cubic feet, was slightly less than in 1955. The discovery well of the Lohrey field reported an initial potential of 6.7 million cubic feet per day. Natural-gas liquids were recovered at Otis by Flynn Oil Co.

**Russell.**—Mineral value in Russell County ($27.5 million) declined for the second year and was $2.7 million less than 1955; however, the county maintained its position as the third largest mineral producer in the State. Over 9.9 million barrels of crude oil was recovered from 36 fields. Two new oilfields, Kune and Worley, were discovered from 158 wells drilled; of this total, 99 were for development oil wells. A small quantity of natural gas was produced in conjunction with petroleum production.

Paving gravel was produced near Russell by the Russell County Highway Department.

**Saline.**—Only two mineral commodities were reported for Saline County in 1956—crude petroleum and sand and gravel. Recovery of crude oil declined 28 percent to 812,000 barrels produced from 11 active fields in the county. Only 8 wells were drilled during the year; 2 found oil, and 6 were dry.

Putnam Sand & Building Co. and Salina Sand Co., Inc., produced sand and gravel near Salina for building and paving.

**Sedgwick.**—The value of mineral production in Sedgwick County ($11 million) continued to rise and was 22 percent over 1955. Crude petroleum, salt, and sand and gravel were responsible for this growth.

Petroleum yield—over 2.7 million barrels—was from 43 fields in Sedgwick County. Fifty-three wells found oil from 111 wells drilled

Digitized by Google

during the year. Five new fields (Chambers Northeast, Gladys Southwest, Brumley Northwest, Latta North, and Greenwich Northeast), all producing from the Mississippian stratum, were discovered. Petroleum was refined by the Derby Oil Co. at Wichita. Cities Service Oil Co. operated its natural-gasoline plant at Wichita. Natural gas was also produced in Sedgwick County.

Seventeen sand and gravel operations were reported in 1956. Important producers were Inland Construction Co., Miles Sand Service, Dolese Bros., Walt Keeler Co., Inc., and Superior Sand Co., Inc. Much of the production was for construction in Wichita. Frontier Chemical Co. pumped brine for the manufacture of salt chemicals in Wichita.

**Seward.**—Production of 30 billion cubic feet of natural gas in Seward County originated from 5 fields. The Plains West gasfield was discovered and recorded an initial potential of 21 million cubic feet of natural gas per day. Gas-development projects represented nearly all of the drilling activity. Most of these wells were drilled in the Hugoton gas area. Much of the natural gas was processed by natural-gasoline plants of Panhandle-Eastern Pipeline Co. and Northern Natural Gas Co. A small quantity of crude petroleum was produced.

**Shawnee.**—Crushed limestone was produced by Henry C. Luttjohann, Netherland Stone Co., and Shawnee County Engineer from quarries near Topeka. Pattons Crushed Stone Co. also produced crushed limestone near Pauline. Most of the limestone was used for concrete, road metal, and screening purposes. A small quantity was produced for agricultural purposes.

Sand and gravel (principally used for building and paving) was mined near Topeka by the Kansas Sand Co., Inc., River Sand Co., Inc., Shoffner Sand, Inc., Inland Construction Co., and Victory Sand & Stone, Inc. Small quantities of blast, engine, and other sands also were produced. Road building, industrial construction, and residential construction in the City of Topeka was responsible, in part, for the increased construction materials output.

**Sheridan.**—The total output of crude petroleum (402,000 barrels) increased approximately 14 percent from 1955. Wells drilled numbered 31 and resulted in the discoveries of 2 new fields: Advance and Hoxie. Both fields reported over 500 barrels per day initial potentials. The Chicago field, discovered in 1955, was abandoned because no production was reported.

Paving gravel was stripped by Harry Henery, Inc., and Sheridan County Highway Department near Hoxie. Paving sand was produced by Carl Kaiser, near Grainfield.

**Stafford.**—Stafford County was seventh in total mineral value in Kansas for 1956. The recovery of petroleum from 158 fields was 6.2 million barrels. Of 249 wells drilled, 13 new fields were discovered. Important new fields were: Rattlesnake East (1,393 barrels per day), Dillwin (265), Liess (235), and Seevers Northwest (205). The Knoche South field was abandoned. Over 1 billion cubic feet of natural gas was produced during the year.

Structural and paving sands were produced by the Partin Sand & Gravel Co. near Stafford. Paving sand was stripped by the Stafford County engineer near Saint John.

465877—58——32

Digitized by Google

**Stanton.**—Seventeen billion cubic feet of natural gas in Stanton County was recovered from the Hugoton gas area. This quantity of natural gas represents an increase of 9 percent from the previous year. Only seven development and exploration wells were drilled.

Harry Henery, Inc., operated a quarry near Manter to produce paving sand and gravel.

**Stevens.**—Stevens County was the leading producer of natural gas in Kansas with over 102 billion cubic feet, all from the Hugoton gas area. Two new gasfields—Hanke and Panoma—were discovered and reported initial potentials of 7.5 million and 16 million cubic feet per day respectively. No other minerals were produced.

**Sumner.**—The 1956 mineral value, $8.9 million, was 10 percent greater than 1955. Over 3 million barrels of petroleum were reported from 44 fields. The number of wells drilled was 175, of which 87 were oil productive. Four new fields were discovered: Beatie, Latta Northwest, Meek, and Portland South. The yield of natural gas increased to over 2.7 billion cubic feet.

Paving gravel was produced by the Sumner County Highway Department near Wellington. Mulvane Sand Co., Inc., produced structural and paving sand near Mulvane.

**Trego.**—Approximately 1.5 million barrels of crude petroleum was produced from 29 fields, and output was 37 percent more than in the previous year. Six new oilfields (Adair Southwest, Kroeger, Newcomer, Newcomer Northwest, Page Creek, and Rhoden) were discovered. The Newcomer and Newcomer Northwest reported initial potential of 3,000 and 1,642 barrels per day, respectively.

Sand and gravel for paving purposes was produced by the Siebert Sand Co. at its pits near Ransom. Trego County Highway Department obtained paving gravel near Wakeeney.

**Wilson.**—Expanded facilities of the Consolidated Cement Co. plant at Fredonia resulted in increased production and shipments of cement. Wilson County replaced Neosho County as the third-ranking county for cement.

The recovery of crude petroleum from 12 fields decreased slightly from 1955. Drilling activity increased considerably as 126 wells were drilled, compared with 86 wells drilled in 1955. Standard Oil Co. (Indiana) was adding a 6,000-barrel-per-day ultraformer and a 6,000-barrel-per-day hydrofining unit at its Neodesha refinery.[29] Natural gas was reported in Wilson County.

Limestone was crushed by Carr Rock Products Co. at Neodesha, Benedict Rock Lime Co. at Benedict, and Anderson-Oxandale for concrete, road metal, screening, and agricultural purposes. Acme Brick Co. at Buffalo and Excelsior Brick Co. at Fredonia manufactured heavy clay products from miscellaneous clay.

**Woodson.**—The quantity of crude petroleum recovered from 23 fields in Woodson County was nearly 1 million barrels and included production by secondary recovery methods. Two oilfields, Annabelle and Rose East, and one gas field—Gordon—were discovered. A small quantity of natural gas was produced in the county.

---

[29] Oil and Gas Journal, vol. 55, No. 12, Mar. 25, 1957, p. 211.

Digitized by Google

**Wyandotte.**—Continued activity in construction and road building in the Kansas City area was shown in 1956. Lone Star Cement Corp. increased production and shipments of cement from 1955. Limestone was quarried and crushed near Turner and Kansas City by American Rock Crusher Co., Peerless Quarries, Inc., and Thompson Strauss Quarries, Inc., for riprap, concrete, road metal, and asphalt filler.

Nine operators produced sand in Wyandotte County, which was used as structural, paving, filter, engine, railroad ballast, molding, and other sand uses. A small quantity of building gravel was also produced. Important producers included Stewart Sand Material Co., Peck-Woolf Sand & Material Co., Holliday Sand & Gravel Co., Builders Sand Co., and American Sand Co.

The county was one of the great centers of activity for the production of crushed limestone in Kansas, and three producers were responsible for the large output. Crushed stone was used principally in Kansas City for construction and road building.

Natural gas was produced from Roberts-Maywood field in Wyandotte and Leavenworth Counties.

Digitized by Google

Digitized by Google

# The Mineral Industry of Kentucky

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Kentucky Geological Survey.

By Avery H. Reed, Jr.,[1] and A. C. McFarland [2]

EXPANSION of the coal-mining industry and record production of LP-gases, crude petroleum, cement, ball clay, miscellaneous clay, and sand and gravel highlighted Kentucky's mineral industry in 1956. Among the States, Kentucky ranked second in ball-clay production, third in bituminous-coal output, and fifth in fluorspar shipments.

The total value of mineral production in 1956 increased 13 percent over 1955 and 35 percent over 1954 but was 12 percent below 1948—the record year.

Coal mining dominated the mineral industry of the State, supplying 75 percent of the total value of the output. Other fuels, including oil and gas, furnished 18 percent. Leading producers were Nashville Coal Co., West Kentucky Coal Co., Blue Diamond Coal Co., and United States Steel Corp.

Defense Minerals Exploration Administration (DMEA) activity consisted of a project for fluorspar in Crittenden County amounting to $21,984.

**TABLE 1.—Mineral production in Kentucky, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 875,699 | $4,416,131 | 904,827 | $4,079,185 |
| Coal | 69,019,910 | 288,665,344 | 74,555,028 | 331,357,660 |
| Fluorspar | 8,899 | 308,140 | 14,865 | 607,704 |
| Lead (recoverable content of ores, etc.) | | | 228 | 71,592 |
| Natural gas, million cubic feet | 73,214 | 17,352,000 | 73,687 | 17,022,000 |
| Natural-gas liquids: | | | | |
| Natural gasoline, thousand gallons | 34,991 | 2,492,000 | 35,275 | 2,414,000 |
| LP-gases, do | 189,247 | 6,451,000 | 248,992 | 8,709,000 |
| Petroleum (crude), thousand 42-gallon barrels | 15,518 | 44,850,000 | 17,628 | 51,297,000 |
| Sand and gravel | 4,898,705 | 5,298,102 | 5,684,124 | 5,974,292 |
| Silver (recoverable content of ores, etc.), troy ounces | | | 31 | 28 |
| Stone | 11,933,899 | 15,579,312 | 11,552,973 | 15,324,278 |
| Zinc (recoverable content of ores, etc.) | | | 417 | 114,258 |
| Value of items that cannot be disclosed: Native asphalt, cement, and iron ore (1956) | | 6,445,725 | | 7,078,812 |
| Total Kentucky [2] | | 391,068,000 | | 443,168,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Total has been adjusted to eliminate duplicating the value of clays and stone.

[1] Chief, Field Office, Division of Mineral Industries, Region V, Bureau of Mines, Knoxville, Tenn.
[2] Director, Kentucky Geological Survey, Lexington, Ky.



Digitized by Google

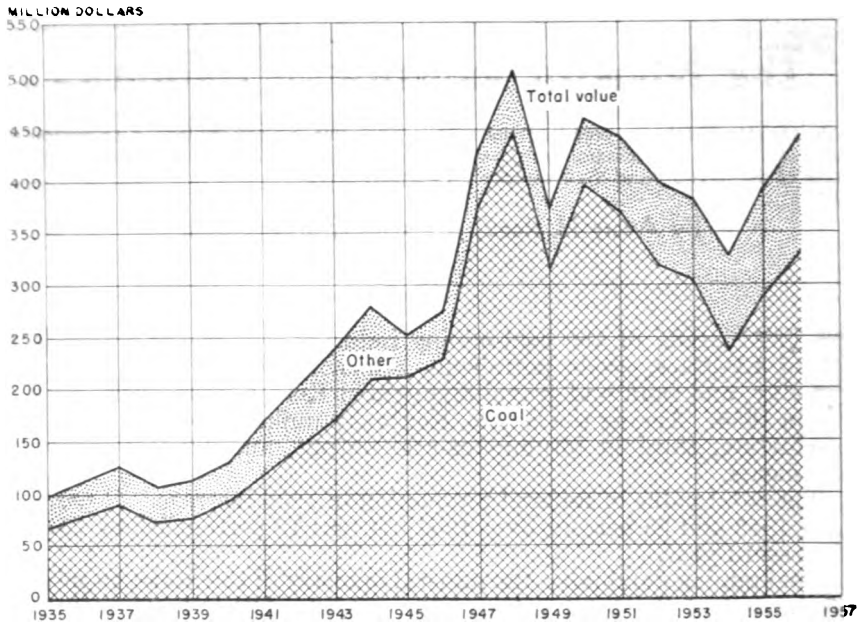



FIGURE 1.—Value of coal and total value of all minerals produced in Kentucky, 1935–56.

**TABLE 2.—Average unit value of mineral commodities produced in Kentucky, 1947–51 (average), and 1952–56**

| Commodity | | 1947–51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|
| Clays: | | | | | | | |
| Ball | short ton | $11.84 | $12.80 | $9.70 | $13.10 | $13.43 | $13.03 |
| Fire | do. | 4.86 | 6.56 | 5.20 | 6.67 | 6.77 | 6.30 |
| Miscellaneous | do. | .88 | 1.13 | 1.40 | 1.50 | 1.42 | 1.37 |
| Coal | do. | 4.95 | 4.80 | 4.66 | 4.16 | 4.18 | 4.44 |
| Fluorspar | do. | 31.83 | 38.57 | 44.46 | 42.15 | 34.63 | 40.88 |
| Lead | do. | 315.60 | 322.00 | 262.00 | 274.00 | ---------- | 314.00 |
| Natural gas | thousand cubic feet | .19 | .22 | .22 | .23 | .23 | .23 |
| Natural-gas liquids: | | | | | | | |
| Natural gasoline | gallon | .07 | .07 | .07 | .06 | .06 | .07 |
| LP-gases | do. | .03 | .03 | .03 | .03 | .03 | .03 |
| Petroleum | 42-gallon barrel | 2.63 | 2.76 | 2.91 | 2.92 | 2.89 | 2.91 |
| Sand and gravel: | | | | | | | |
| Sand | short ton | (1) | .90 | .94 | .91 | 1.08 | 1.06 |
| Gravel | do. | (1) | .72 | .95 | .95 | 1.08 | 1.04 |
| Stone: | | | | | | | |
| Limestone, crushed | do. | 1.21 | 1.22 | 1.25 | 1.31 | 1.30 | 1.32 |
| Sandstone, crushed | do. | (1) | 1.50 | ---------- | 2.78 | 2.21 | 2.23 |
| Ssandstone, dimension | do. | (1) | (1) | 7.98 | 16.45 | 13.29 | 12.89 |
| Zinc | do. | 280.80 | 332.00 | 230.00 | 216.00 | ---------- | 274.00 |

[1] Figure withheld to avoid disclosing individual company confidential data.

## EMPLOYMENT AND INJURIES

Reports submitted to the Bureau of Mines by producers indicate that employment in the mineral industries of Kentucky decreased 14 percent below 1955. Employment decreased 16 percent at coal mines, increased 9 percent at quarries and mills, decreased 9 percent at nonmetal mines, was about the same at sand and gravel mines, and decreased 2 percent at coke ovens and smelters.

Digitized by Google

The frequency rate of injuries increased 1 percent over 1955. The frequency rate declined 62 percent at coke ovens and smelters, decreased 71 percent at nonmetal mines, fell 30 percent at quarries and mills, and increased 5 percent at coal mines. There were 78 fatal injuries, compared with 65 in 1955.

**TABLE 3.—Employment in the mineral industries, 1955–56** [1]

| Industry | 1955 | | | 1956 [2] | | |
|---|---|---|---|---|---|---|
| | Men working daily | Average active days | Man-days worked | Men working daily | Average active days | Man-days worked |
| Coal mines | 39,240 | 183 | 7,192,448 | 30,666 | 197 | 6,038,183 |
| Quarries and mills | 1,444 | 254 | 366,236 | 1,685 | 238 | 400,796 |
| Nonmetal mines | 487 | 173 | 84,134 | 475 | 162 | 76,804 |
| Sand and gravel mines [3] | 354 | 261 | 92,355 | 350 | 263 | 92,036 |
| Coke ovens and smelters | 304 | 353 | 107,272 | 288 | 366 | 105,246 |
| Metal mines | | | | 11 | 34 | 380 |
| Total | 41,829 | 187 | 7,842,445 | 33,475 | 201 | 6,713,445 |

[1] Excluding oil and gas.
[2] Preliminary figures.
[3] Excluding Government-and-contractor operations.

**TABLE 4.—Injuries in the mineral industries, 1955–56** [1]

| Industry [2] | 1955 | | | | 1956 [3] | | | |
|---|---|---|---|---|---|---|---|---|
| | Fatal | Nonfatal | Total | Injuries per million man-days | Fatal | Nonfatal | Total | Injuries per million man-days |
| Metal mines | | | | | | | | |
| Coke ovens and smelters | | 16 | 16 | 149 | | 6 | 6 | 57 |
| Nonmetal mines | 1 | 29 | 30 | 357 | | 8 | 8 | 104 |
| Quarries and mills | 5 | 176 | 181 | 494 | 2 | 137 | 139 | 347 |
| Coal mines | 59 | 1,967 | 2,026 | 355 | 76 | 2,175 | 2,251 | 373 |
| Total | 65 | 2,188 | 2,253 | 360 | 78 | 2,326 | 2,404 | 363 |

[1] Excluding oil and gas.
[2] Sand and gravel mines not canvassed.
[3] Preliminary figures.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Asphalt (Native).**—Bituminous sandstone was mined in Edmonson County for roadstone.

**Coal.**—Coal mining continued the recovery begun in 1955, mainly owing to increased demand for power generation. Coal was produced at 2,044 mines in 39 counties, with Harlan, Hopkins, and Pike outstanding in output. Leading producing companies were Nashville Coal Co., West Kentucky Coal Co., Blue Diamond Coal Co., United States Steel Corp., and Ken Coal Co. Production increased 8 percent over 1955, to the highest figure since 1951, but was still 9 percent below the peak year 1947. In the Eastern Kentucky field coal was mined at 1,903 mines in 30 counties and in the Western Kentucky field at 141 mines in 9 counties. The Eastern field produced 45 million tons and The Western field 29.6 million tons.

Digitized by Google

TABLE 5.—Coal production, 1947–51 (average) and 1952–56

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 76, 475, 165 | $378, 456, 752 | 1955 | 69, 019, 910 | $288, 665, 344 |
| 1952 | 66, 114, 341 | 317, 386, 725 | 1956 | 74, 555, 028 | 331, 357, 660 |
| 1953 | 65, 060, 478 | 302, 871, 877 | | | |
| 1954 | 56, 964, 408 | 236, 736, 940 | Earliest record to date | 2, 440, 955, 000 | (1) |

[1] Data not available.

**Oil and Gas.**—Oil and gas were produced from the Eastern, Central, and Western fields. Most of the oil was produced in the Western field and most of the gas in the Eastern field. An increase in drilling activity and further development of secondary-recovery projects caused an increase in total output of oil. New discoveries included 27 new pools, 37 extensions of old pools, and 20 new pays in known producing areas.

**Natural Gas.**—Marketed production of natural gas increased 1 percent over 1955 to the highest output since 1951 but was 24 percent below 1947—the record year.

TABLE 6.—Marketed production of natural gas, 1947–51 (average) and 1952–56

| Year | Million cubic feet | Value | Year | Million cubic feet | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 73, 564 | $13, 634, 200 | 1954 | 72, 713 | $16, 579, 000 |
| 1952 | 73, 427 | 15, 934, 000 | 1955 | 73, 214 | 17, 352, 000 |
| 1953 | 71, 405 | 15, 638, 000 | 1956 | 73, 687 | 17, 022, 000 |

**Natural-Gas Liquids.**—*Natural gasoline.*—Production of natural gasoline increased 1 percent over 1955 and was about the same as in 1953, the peak year.

TABLE 7.—Production of natural gasoline, 1947–51 (average) and 1952–56

| Year | Thousand gallons | Value (thousand dollars) | Year | Thousand gallons | Value (thousand dollars) |
|---|---|---|---|---|---|
| 1947–51 (average) | 9, 930 | 739 | 1954 | 28, 224 | 1, 552 |
| 1952 | 30, 660 | 2, 191 | 1955 | 34, 991 | 2, 492 |
| 1953 | 35, 406 | 2, 394 | 1956 | 35, 275 | 2, 414 |

*LP-Gases.*—Production of liquefied-petroleum gases increased 32 percent over 1955, establishing a new annual record.

TABLE 8.—Production of LP-gases, 1947–51 (average) and 1952–56

| Year | Thousand gallons | Value (thousand dollars) | Year | Thousand gallons | Value (thousands dollars) |
|---|---|---|---|---|---|
| 1947–51 (average) | 62, 010 | 1, 674 | 1954 | 189, 966 | 5, 066 |
| 1952 | 156, 198 | 3, 963 | 1955 | 189, 247 | 6, 451 |
| 1953 | 176, 232 | 4, 993 | 1956 | 248, 992 | 8, 709 |

Digitized by Google

**Petroleum.**—Production of crude petroleum increased 14 percent over 1955 and 28 percent over 1954, establishing an alltime record.

**Table 9.—Production of crude petroleum, 1947–51 (average) and 1952–56**

| Year | Thousand barrels | Value (thousand dollars) | Year | Thousand barrels | Value (thousand dollars) |
|---|---|---|---|---|---|
| 1947–51 (average) | 9,771 | 25,788 | 1954 | 13,791 | 40,270 |
| 1952 | 11,918 | 32,890 | 1955 | 15,518 | 44,850 |
| 1953 | 11,518 | 33,520 | 1956 | 17,628 | 51,297 |

**TABLE 10.—Production of crude petroleum by counties, 1956** [1]

| County | Barrels | County | Barrels |
|---|---|---|---|
| Allen | 71,010 | Lee | 537,505 |
| Barren | 64,356 | Leslie | 899 |
| Bath | 5,895 | Letcher | 128 |
| Boyd | 702 | Logan | 4,053 |
| Breathitt | 39,332 | McCreary | 3,637 |
| Breckinridge | 32,554 | McLean | 1,137,926 |
| Butler | 106,471 | Magoffin | 2,064,241 |
| Christian | 1,833,547 | Martin | 30,248 |
| Clinton | 69,396 | Meade | 77 |
| Crittenden | 1,071 | Menifee | 503 |
| Cumberland | 22,087 | Metcalfe | 29 |
| Daviess | 1,461,657 | Monroe | 1,097 |
| Edmonson | 207 | Montgomery | 76 |
| Elliott | 114,486 | Morgan | 917 |
| Estill | 157,419 | Muhlenberg | 927,183 |
| Floyd | 17,997 | Ohio | 1,243,926 |
| Grayson | 67 | Owsley | 1,383 |
| Green | 9,464 | Pike | 34,527 |
| Greenup | 1,767 | Powell | 59,405 |
| Hancock | 507,609 | Russell | 267 |
| Hart | 33,699 | Simpson | 12,537 |
| Henderson | 3,053,808 | Todd | 29,742 |
| Hopkins | 40,490 | Union | 1,952,599 |
| Jackson | 1,102 | Warren | 48,229 |
| Johnson | 274,139 | Wayne | 20,356 |
| Knott | 20,240 | Webster | 1,360,158 |
| Knox | 2,806 | Wolfe | 57,410 |
| Laurel | 216 | | |
| Lawrence | 155,348 | Total | 17,628,000 |

[1] Data from Kentucky Geological Survey.

## NONMETALS

**Cement.**—Kosmos Portland Cement Co. operated the Kosmosdale plant throughout 1956, producing masonry and portland cements. Shipments of masonry cement decreased 3 percent below 1955. Shipments of portland cement increased 3 percent above 1955, establishing a new annual record.

**Clays.**—Four companies mined ball clay in Graves County. The leading producer was Kentucky-Tennessee Clay Co. Production increased 3 percent over 1955, establishing an alltime high. The clay was used for whiteware, art pottery, enameling, floor and wall tile, firebrick and block, saggers, and other purposes.

Ten companies mined fire clay at 17 mines in Carter and Greenup Counties. Leading producers were General Refractories Co. and Harbison-Walker Refractories Co., with operations in Carter County. Production was 11 percent below 1955 and 48 percent below 1951, the peak year. The clay was used for firebrick and block, fire-clay mortar, and heavy clay products.

Digitized by Google

Seventeen companies mined miscellaneous clay in 11 counties. Leading producers were Kosmos Portland Cement Co., operating in Jefferson County, and Kentucky Light Aggregates, Inc., operating in Bullitt County. The clay was used for art pottery, floor and wall tile, heavy clay products, lightweight aggregates, and cement. Production increased 15 percent over 1955 and established a new annual record.

**TABLE 11.—Clays sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Ball clay | | Fire clay | | Miscellaneous clay | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 101,913 | $1,208,120 | 479,343 | $2,355,494 | 181,288 | $159,403 | 762,544 | $3,723,017 |
| 1952 | 107,211 | 1,372,695 | 526,238 | 3,450,046 | 247,425 | 278,525 | 880,874 | 5,101,266 |
| 1953 | 100,482 | 974,637 | 348,359 | 1,809,988 | 262,368 | 333,727 | 711,209 | 3,118,352 |
| 1954 | 96,483 | 1,263,526 | 197,400 | 1,316,364 | 277,598 | 415,036 | 571,481 | 2,994,926 |
| 1955 | 111,600 | 1,498,950 | 341,862 | 2,315,715 | 422,237 | 601,466 | 875,699 | 4,416,131 |
| 1956 | 115,243 | 1,501,550 | 303,275 | 1,912,015 | 486,309 | 665,620 | 904,827 | 4,079,185 |

**Fluorspar.**—The fluorspar industry continued to operate under depressed market conditions because the steel industry replaced domestic fluorspar with imported material. Calvert City Chemical Co. opened a new mine at Dyers Hill (Livingstone County) and produced Acid-grade fluorspar for its own use. Fifteen other companies or individuals operated shallow mines or processed mine dump and settling ponds. Eight companies processed or blended purchased fluorspar for shipment to consumers. Marketed production was 14,000 tons in 1956, compared with 9,700 tons in 1955.

**TABLE 12.—Fluorspar shipped from mines, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 77,471 | $2,456,849 | 1954 | 35,831 | $1,510,344 |
| 1952 | 48,308 | 1,863,262 | 1955 | 8,899 | 308,140 |
| 1953 | 47,244 | 2,100,493 | 1956 | 14,865 | 607,704 |

**Sand and Gravel.**—Thirty companies mined sand and gravel in 17 counties. Leading producers were C & H Gravel Co. (Gallatin County); Standard Materials Corp. (Carroll County); and Ohio River Sand Co. (Jefferson County). Total output in 1956 increased 16 percent over 1955 and set a new annual record.

**TABLE 13.—Sand and gravel sold or used by producers, 1947–51 (average), and 1952–56**

| Year | Sand | | Gravel | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | (1) | (1) | (1) | (1) | 2,416,340 | $2,186,507 |
| 1952 | 1,461,655 | $1,314,641 | 1,872,606 | $1,341,412 | 3,334,261 | 2,656,053 |
| 1953 | 1,399,817 | 1,322,674 | 1,652,338 | 1,577,258 | 3,052,155 | 2,899,932 |
| 1954 | 2,653,074 | 2,424,407 | 2,076,532 | 1,977,386 | 4,729,606 | 4,401,793 |
| 1955 | (1) | (1) | (1) | (1) | 4,898,705 | 5,298,102 |
| 1956 | 2,924,180 | 3,091,664 | 2,759,944 | 2,882,628 | 5,684,124 | 5,974,292 |

[1] Figure withheld to avoid disclosing individual company confidential data.

Digitized by Google

**TABLE 14.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Sand: | | | | |
| Structural | 1,973,564 | $2,223,253 | 2,024,359 | $2,189,029 |
| Paving | 772,974 | 743,042 | 805,850 | 805,079 |
| Other | (1) | (1) | 93,971 | 97,556 |
| Total sand | (1) | (1) | 2,924,180 | 3,091,664 |
| Gravel: | | | | |
| Structural | 1,450,416 | 1,676,416 | 1,430,238 | 1,615,376 |
| Paving | 507,585 | 484,699 | 1,258,516 | 1,231,204 |
| Other | (1) | (1) | 71,190 | 36,048 |
| Total gravel | (1) | (1) | 2,759,944 | 2,882,628 |
| Total sand and gravel | 4,898,705 | 5,298,102 | 5,684,124 | 5,974,292 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Total sand and gravel."

**Stone.**—Sixty operators produced crushed limestone at 80 quarries in 54 counties. The leading producers were Kentucky Stone Co. (operating in Anderson, Breckinridge, Hardin, Jessamine, Lee, Logan, Madison, Rockcastle, and Todd Counties); Louisville Crushed Stone Co. (Jefferson County); Franklin Limestone Co. (Livingston County); and Kosmos Portland Cement Co. (Meade County). Total production in 1956 decreased 3 percent below 1955—the peak year.

Levi Polly and Thomas C. Mayne crushed sandstone for concrete and roads; output in 1956 was 27 percent below that in 1955. Kolar

**TABLE 15.—Crushed and broken stone sold or used by producers, 1947–51 (average), and 1952–56**

| Year | Limestone | | Sandstone | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 6,532,365 | $7,892,585 | (1) | (1) | (1) | (1) |
| 1952 | 8,687,315 | 10,636,291 | 25,645 | $38,468 | 8,712,960 | $10,674,759 |
| 1953 | 7,429,505 | 9,268,237 | | | 7,429,505 | 9,268,237 |
| 1954 | 10,120,653 | 13,237,726 | 7,400 | 20,560 | 10,128,053 | 13,258,286 |
| 1955 | 11,921,870 | [2] 15,521,272 | 9,193 | 20,336 | 11,931,063 | [2] 15,541,608 |
| 1956 | 11,544,414 | 15,285,923 | 6,750 | 15,045 | 11,551,164 | 15,300,968 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Revised figure.

**TABLE 16.—Crushed limestone sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Concrete and roads | 9,217,156 | $12,221,629 | 8,959,279 | $12,121,944 |
| Agstone | 1,255,305 | 1,584,348 | 967,342 | 1,276,722 |
| Railroad ballast | 367,404 | 391,637 | 513,556 | 460,652 |
| Riprap | 418,282 | 423,384 | 372,540 | 373,287 |
| Asphalt filler | (1) | (1) | 75,000 | 150,000 |
| Fertilizer filler | (1) | (1) | 4,800 | 6,480 |
| Other uses | 663,723 | [2] 900,274 | 651,897 | 896,838 |
| Total | 11,921,870 | [2] 15,521,272 | 11,544,414 | 15,285,923 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other uses."
[2] Revised figure.



Digitized by Google

Stone Quarries, Kentucky Flagstone Co., and Thomas C. Mayne quarried 1,800 tons of dimension sandstone for rough construction, rubble, and rough architectural building stone and for flagging compared with 2,800 tons in 1955.

## METALS

**Iron Ore.**—J. Willis Crider Fluorspar Co. shipped a small quantity of brown iron ore from Crittenden County.

**Lead.**—Calvert City Chemical Co. recovered 228 tons of lead from fluorspar milling operations.

**Pig Iron.**—Armco Steel Corp. produced foundry and basic pig iron at Ashland.

**Silver.**—Calvert City Chemical Co. recovered 31 fine ounces of silver from lead concentrate. This was the first recorded production of silver in the State, although it has been known that lead concentrate from Kentucky contains some silver.

**Zinc.**—Calvert City Chemical Co. recovered 417 tons of zinc from fluorspar-milling operations.

## REVIEW BY COUNTIES

Of 120 counties in the State, 94 reported mineral production, compared with 96 in 1955. Leading counties were the large coal producers, Harlan, Hopkins, Pike, Letcher, and Floyd, each yielding minerals valued at more than $25 million. County figures do not include native asphalt, natural gas, natural-gas liquids, and petroleum, or do they include an output of 600,000 tons of sand and gravel of undetermined county origin.

**TABLE 17.—Value of mineral production in Kentucky, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Adair | $153,910 | $138,330 | Limestone. |
| Allen | 25,171 | 144,000 | Do. |
| Anderson | (3) | (3) | Do. |
| Ballard | 458 | 6,697 | Sand and gravel. |
| Barren | 191,520 | 150,182 | Limestone. |
| Bell | (3) | (3) | Coal, limestone, sandstone. |
| Boone | (3) | (3) | Sand and gravel. |
| Bourbon | (3) | 119,277 | Limestone. |
| Boyd | (3) | (3) | Coal, miscellaneous clay. |
| Boyle | (3) | 315,784 | Limestone. |
| Breathitt | 2,818,722 | 3,776,169 | Coal. |
| Breckinridge | 321,298 | (3) | Limestone, miscellaneous clay. |
| Bullitt | (3) | (3) | Miscellaneous clay, limestone. |
| Butler | (3) | 466,557 | Coal. |
| Caldwell | (3) | 148,108 | Limestone, fluorspar. |
| Calloway | 2,216 | 8,162 | Sand and gravel. |
| Carlisle | 788 | 1,500 | Do. |
| Carroll | (3) | (3) | Do. |
| Carter | 2,744,454 | 2,611,482 | Fire clay, coal, limestone. |
| Casey | 151,300 | 250,000 | Limestone. |
| Christian | (3) | 962,947 | Do. |
| Clark | (3) | 227,125 | Do. |
| Clay | 3,338,092 | 5,220,798 | Coal. |
| Clinton | 313,824 | 259,724 | Coal, limestone. |
| Crittenden | 489,900 | 492,795 | Limestone, fluorspar, iron ore. |
| Cumberland | (3) | 4,148 | Limestone. |
| Daviess | [4] 2,278,949 | 3,782,787 | Coal, sand and gravel. |
| Edmonson | (3) | 108,000 | Limestone. |
| Elliott | 73,434 | 50,150 | Coal. |
| Estill | (3) | | |
| Fayette | (3) | 647,714 | Limestone. |
| Fleming | 352,086 | 360,230 | Do. |

See footnotes at end of table.

Digitized by Google

**TABLE 17.—Value of mineral production in Kentucky, 1955–56, by counties [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Floyd | $29,445,372 | (3) | Coal, sand and gravel. |
| Franklin | (3) | $346,295 | Limestone. |
| Fulton | (3) | (3) | Sand and gravel. |
| Gallatin | 109,570 | 875,834 | Do. |
| Graves | 1,623,457 | 1,501,550 | Ball clay. |
| Grayson | (3) | (3) | Limestone. |
| Greenup | (3) | 138,448 | Sand and gravel, fire clay. |
| Hancock | 80,855 | 106,120 | Miscellaneous clay, coal. |
| Hardin | 693,835 | 656,635 | Limestone. |
| Harlan | 47,493,157 | (3) | Coal, limestone. |
| Harrison | (3) | (3) | Limestone. |
| Hart | (3) | 147,500 | Do. |
| Henderson | (3) | 1,674,034 | Coal, sand and gravel. |
| Hickman | ---------- | 7,095 | Sand and gravel. |
| Hopkins | 26,973,207 | 51,263,342 | Coal, miscellaneous clay. |
| Jackson | 995,104 | 606,626 | Coal. |
| Jefferson | 9,477,453 | 10,471,782 | Cement, limestone, sand and gravel, miscellaneous clay. |
| Jessamine | (3) | (3) | Limestone. |
| Johnson | 2,032,098 | 1,918,077 | Coal. |
| Kenton | (3) | 19,950 | Limestone. |
| Knott | 3,551,033 | 3,971,623 | Coal. |
| Knox | (3) | 1,355,290 | Do. |
| Laurel | 223,751 | 641,743 | Do. |
| Lawrence | 38,040 | 134,402 | Do. |
| Lee | (3) | (3) | Coal, limestone. |
| Leslie | 10,388,589 | 11,787,827 | Coal. |
| Letcher | (3) | 33,195,739 | Coal, limestone. |
| Livingston | (3) | (3) | Limestone, fluorspar, zinc, lead, silver. |
| Logan | (3) | (3) | Limestone, sandstone. |
| Lyon | 932 | ---------- | |
| Madison | (3) | (3) | Limestone, miscellaneous clay. |
| Magoffin | 330,597 | 18,759 | Coal. |
| Marion | (3) | 219,000 | Limestone. |
| Marshall | 3,901 | 20,024 | Sand and gravel. |
| Martin | 279,498 | 138,168 | Coal. |
| Mason | (3) | 76,880 | Sand and gravel. |
| McCracken | 311,032 | 250,650 | Do. |
| McCreary | 2,913,537 | 2,333,665 | Coal, sandstone. |
| Meade | (3) | (3) | Limestone. |
| Menifee | (3) | 120,117 | Do. |
| Mercer | (3) | 114,236 | Do. |
| Metcalfe | (3) | 92,685 | Do. |
| Monroe | (3) | (3) | Do. |
| Morgan | (3) | 627,650 | Coal, limestone. |
| Muhlenberg | (3) | (3) | Do. |
| Nelson | (3) | 211,000 | Limestone. |
| Ohio | (3) | 9,177,693 | Coal, limestone. |
| Oldham | (3) | 135,000 | Limestone. |
| Owsley | ---------- | 57,062 | Coal. |
| Pendleton | (3) | 349,550 | Limestone. |
| Perry | 21,757,067 | 27,361,638 | Coal. |
| Pike | 41,282,800 | 47,114,990 | Do. |
| Powell | (3) | (3) | Limestone, miscellaneous clay. |
| Pulaski | (3) | (3) | Coal, limestone. |
| Rockcastle | (3) | (3) | Do. |
| Rowan | (3) | (3) | Limestone, miscellaneous clay. |
| Simpson | (3) | 111,000 | Limestone. |
| Todd | (3) | 97,822 | Do. |
| Trigg | (3) | ---------- | |
| Trimble | (3) | ---------- | |
| Union | 7,251,139 | 8,885,814 | Coal, sand and gravel, miscellaneous clay. |
| Warren | (3) | 139,100 | Limestone. |
| Wayne | 409,637 | 252,195 | Coal, limestone. |
| Webster | (3) | 3,754,972 | Coal. |
| Whitley | (3) | 1,306,618 | Coal, miscellaneous clay. |
| Wolfe | 38,500 | 21,750 | Coal. |
| Undistributed | [4] 170,107,790 | 199,107,384 | |
| Total | 391,068,000 | 443,168,000 | |

[1] County figures exclude native asphalt, natural gas, natural-gas liquids, and petroleum; included with "Undistributed." The following counties are not listed because no production was reported: Bath, Bracken, Campbell, Garrard, Grant, Green, Henry, Larue, Lewis, Lincoln, McLean, Montgomery, Nicholas, Owen, Robertson, Russell, Scott, Shelby, Spencer, Taylor, Washington, and Woodford.

[2] Other than native asphalt, natural gas, natural-gas liquids, and petroleum.

[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[4] Revised figure.

Digitized by Google

**Adair.**—Shamrock Stone, Inc. (Butler quarry), crushed 93,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Allen.**—McLellan Stone Co. opened a new quarry and produced 77,000 tons of limestone for concrete aggregate and roadstone.

**Anderson.**—Kentucky Stone Co. (Tyrone mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production in 1956 increased 9 percent over 1955.

**Ballard.**—The Kentucky State Highway Department mined 9,000 tons of paving gravel.

**Barren.**—J. F. Pace Construction Co. crushed 112,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone.

**Bell.**—Coal production was 1,165,000 tons from 65 mines; the Crockett mine (Kentucky Ridge Coal Co.) and Amru Strip mine (Rochester and Pittsburg Coal Co.) were the leading producers. Kentucky-Virginia Stone Co. (Pineville quarry) crushed limestone for riprap, concerete aggregate, roadstone; production declined 30 percent below 1955. Levi Polly (Pine Mountain quarry) produced 6,700 tons of sandstone for concrete aggregate and roadstone.

**Boone.**—Belleview Gravel Co. and Kentucky Sand Co. mined sand and gravel for structural, paving, and other uses. Production rose 32 percent above 1955, owing to initial production by Kentucky Sand Co.

**Bourbon.**—Bourbon Limestone Co., Inc. (Snapp quarry), crushed 92,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Boyd.**—Eight mines produced 244,000 tons of coal in 1956. The Coalton Strip mine (Charles E. Yates) was the leading producer. Big Run Coal & Clay Co. (Princess mine) mined miscellaneous clay for heavy clay products.

**Boyle.**—Boyle County Highway Department (Perryville quarry) and Caldwell Stone Co., Inc. (Danville quarry), crushed 212,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Breathitt.**—Coal output totaled 671,000 tons from 21 mines; the No. 3 Elkhorn mine (Allen Creek Coal Co.) was the principal producer.

**Breckinridge.**—Hardinsburg Stone Co. and Kentucky Stone Co. (Webster quarry) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production increased 13 percent over 1955. Murry Tile Co., Inc. (Cloverport mine), mined miscellaneous clay for floor and wall tile.

**Bullitt.**—Kentucky Light Aggregates, Inc. (Shepherdsville mine), mined miscellaneous clay for lightweight aggregates; production was twice as much as in 1955. Sam Nally Co. opened a new quarry and crushed limestone for concrete aggregate and roadstone.

**Butler.**—Seven mines produced 129,000 tons of coal in 1956. The leading producers was the Williams South Hill mine (Williams Bros. Mining Co.).

**Caldwell.**—Fredonia Valley Quarries, Inc. (Fredonia quarry), produced 128,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone. Michigan & Kentucky Fluorspar Co. and P. L. Perkins mined 96 tons of fluorspar.

**Calloway.**—The State highway department produced 16,200 tons of paving gravel.

Digitized by Google

**Carlisle.**—Clarence Guhy (Williams mine) mined 1,500 tons of structural sand.

**Carroll.**—Carrolton Gravel-Sand Co., Inc., and Standard Materials Co. produced structural sand and structural and railroad-ballast gravel.

**Carter.**—Fire clay for fire brick and block, fire-clay mortar, and heavy clay products was produced by Cooper & Kiser (Kehoe mine), General Refractories Co. (Olive Hill mine), Harbison-Walker Refractories Co. (Brinegar, Riggs, and Stinson mines), Ironton Firebrick Co. (Bradmyer mine), Louisville Firebrick Works, Inc. (Aden mine), Maynard Bros. Clay Co. (Grayson mine), North American Refractories Co. (Bailey Clay, Hayward, and Lowe No. 1 mines), Star Clay Co. (Rush mine), and Vincent Mining Co. (Soldier No. 1 mine). The output totaled 287,000 tons, and the leading producer was General Refractories Co. Coal production was 128,000 tons from 5 mines; the Grayson Block mine (Fields Branch Coal Co.) was the principal producer. Standard Slag Co. crushed 78,000 tons of limestone for concrete aggregate and roadstone.

**Casey.**—Casey Stone Co. (Bethel Ridge mine) mined 126,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Christian.**—Harry Berry, Inc. (Fort Campbell quarry), Christian Quarries, Inc., and Hopkinsville Stone Co., Inc. (Hopkinsville quarry), crushed limestone for concrete aggregate, roadstone, agstone, rock dust for coal mines, and other uses.

**Clark.**—Allen Co., Inc. (Boonesboro mine), produced 171,000 tons of limestone for concrete aggregate and roadstone.

**Clay.**—Coal production was 1,302,000 tons from 44 mines. The Thunderbird mine (Courtesy Coal Co.), No. 4 mine (Hacker Coal Co.), and No. 1 Strip mine (Black Raven Coal Co., Inc.) were the leading producers.

**Clinton.**—Three mines produced 34,100 tons of coal in 1956. The leading producer was the No. 2 mine (Bruce Sloan Coal Co.). Shamrock Stone, Inc. (Caldwell quarry), crushed 80,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Crittenden.**—Alexander Stone Co. produced 216,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone. Numerous small producers mined 5,100 tons of fluorspar; the principal operators were Wayne Brown (Holly mine), Everett Crider, Crider & Highfil, J. Willis Crider Fluorspar Co. (Pigmy mine), Cleve Lanham (Krause mine), Marimex Fluorspar Co., and Howard Stout. J. Willis Crider Fluorspar Co. mined a small quantity of brown iron ore. Raynolds Metal Co. began a DMEA project for mining fluorspar at the Ben Belt mine, totaling $21,984, of which the Government share was 50 percent.

**Cumberland.**—Shamrock Stone, Inc. (Burkesville quarry), crushed 3,500 tons of limestone for concrete aggregate, roadstone, and agstone.

**Daviess.**—The output of coal from 10 mines totaled 1,096,000 tons. The K–9 Strip mine (Green Coal Co.) was the principal producer in 1956. Daviess County Sand & Gravel Co. and Owensboro River Sand & Gravel Co. produced 241,000 tons of structural, paving, and engine sand and 87,000 tons of structural and paving gravel.

Digitized by Google

**Edmonson.**—Kentucky Rock Asphalt Co. quarried bituminous sandstone for roadstone. McLellan Stone Co. produced 54,000 tons of limestone for concrete aggregate and roadstone.

**Elliott.**—Coal production was 14,600 tons; the only producer was T. J. Copley Coal Co. (No. 1 mine).

**Fayette.**—Blue Grass Stone Co. (Lexington quarry) and Central Rock Co. (Lexington mine) crushed 451,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Fleming.**—Gorman Construction Co. (Carpenter quarry), produced 241,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone.

**Floyd.**—Floyd County ranked fifth in the State in total value of mineral production. Coal production totaled 5,142,000 tons, and 320 mines were active. The leading producers were Wheelright mine (Inland Steel Co.), Nos. 1 and 2 mines (Princess Elkhorn Coal Co.), and Stephens mine (Stephens Elkhorn Fuel Corp.). W. L. Walters Pike Sand Co. opened a new pit and mined structural and engine sand.

**Franklin.**—Blanton Stone Co., Inc. (Frankfort mine), and Frankfort Builders Supply Co., Inc. (Devil's Hollow mine), crushed 261,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Fulton.**—Hickman Sand & Gravel Co. and the State highway department mined paving sand and gravel; production in 1956 increased 7 percent over 1955

**Gallatin.**—C & H Gravel Co. (Sam Hill mine) and Gallatin Sand & Gravel Co. (Warsaw mine) produced 12,000 tons of structural and paving sand and 863,000 tons of structural and paving gravel.

**Graves.**—Cooley Clay Co., Inc., Kentucky Clay Mining Co. (Lamkin mine), Kentucky-Tennessee Clay Co., and Old Hickory Clay Co. mined 115,000 tons of ball clay for whiteware, art pottery, high-grade tile, kiln furniture, fire brick and block, enameling, and other uses.

**Grayson.**—Ragland Bros. (Letchfield quarry) and Rogers & Brunnhoeffer crushed limestone for riprap, concrete aggregate, roadstone, and agstone; production increased 32 percent over 1955.

**Greenup.**—Worthington Sand & Gravel Co., Inc., produced 51,000 tons of structural and paving sand and 9,000 tons of structural gravel. M. A. McCoy mined 16,600 tons of fire clay for fire brick and block.

**Hancock.**—Booneville Brick & Tile Co., Murray Tile Co., Inc., Owensboro Brick & Tile Co., and Owensboro Sewer Pipe Co. produced 72,000 tons of miscellaneous clay for heavy clay products. Coal output was 2,000 tons; Chester Powers Coal Co. (Powers Strip mine) was the only producer.

**Hardin.**—Kentucky Stone Co. (Lilmay mine and Upton quarry), Osborne Bros., and Waters Construction Co. crushed 507,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone.

**Harlan.**—Harlan County ranked first in the State in total value of mineral production. Coal production from 147 mines was 8,643,000 tons. The No. 32 mine (United States Steel Corp.), No. 2 mine (International Harvester Co.), and Harlan mine (Black Star Coal Corp.) were the principal producers. Sam Nally Co. opened a new quarry and crushed limestone for concrete aggregate and roadstone.

**Harrison.**—Genet Stone Co., Inc. (Cynthiana quarry), produced limestone for concrete aggregate, roadstone and agstone.

Digitized by Google

**Hart.**—McLellan Stone Co. (Horse Cave quarry) crushed 118,000 tons of limestone for concrete aggregate and roadstone.

**Henderson.**—Coal output in 1956 was 282,000 tons from 9 mines. The leading producers were the Mike & Pat mine (Dolph Hazelwood Coal Co.) and Henderson No. 1 mine (Henderson Mining Co., Inc.). Bedford-Nugent Co., Inc., mined 341,000 tons of structural, paving, railroad-ballast, and other sand and 220,000 tons of structural, paving and railroad-ballast gravel.

**Hickman.**—The State highway department produced 15,000 tons of paving gravel.

**Hopkins.**—Hopkins County ranked second in the State in total value of mineral production. Coal production totaled 14,827,000 tons from 54 mines. The principal producers were the Homestead Strip mine (Charbon Stripping Co.), Pleasant View and East Diamond mines (West Kentucky Coal Co.), and Fies mine (Nashville Coal Co.). Clarkes Clay Products Co. (Ashbyburg mine) mined 1,600 tons of miscellaneous clay for heavy clay products.

**Jackson.**—Seventeen mines produced 138,000 tons of coal in 1956. The Travis Creek mine (Travis Creek Fuel Co.) was the outstanding producer.

**Jefferson.**—Kosmos Portland Cement Co. produced masonry and portland cements at Kosmosdale; shipments of masonry cement were 3 percent below those in 1955, and shipments of portland cement increased 3 percent above 1955. Falls City Stone Co. (Fern Creek quarry), Jefferson County Stone Co. (Avoca quarry), Louisville Crushed Stone Co. (Louisville mine), Louisville & Nashville Railroad Co., and Okolona Stone Quarry crushed 1,432,000 tons of limestone for concrete and roadstone, railroad ballast, and agstone. R. W. Greene Sand & Gravel Co., Nugent Sand Co., Ohio River Sand Co., Inc., and E. T. Slider Co., Inc., produced 1,142,000 tons of structural, paving, and other sand and 564,000 tons of structural, paving, and railroad-ballast gravel. General Shale Products Corp. (Coral Ridge mine), Kosmos Portland Cement Co., and Louisville Pottery Co. mined miscellaneous clay for art pottery, cement, and heavy clay products; production in 1956 was 4 percent higher than in 1955.

**Jessamine.**—Kentucky Stone Co. (High Bridge mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone.

**Johnson.**—Coal production from 106 mines was 509,000 tons; the No. 1 mine (Sadler & Kennard Coal Co.) was the leading producer.

**Kenton.**—Franxman Bros. (Covington quarry) crushed 11,400 tons of limestone for concrete aggregate and roadstone.

**Knott.**—Coal output totaled 1,039,000 tons from 126 mines in 1956. The Knott mine (Knott Coal Corp.) produced the largest quantity.

**Knox.**—Coal production was 349,000 tons, and 48 mines were active. The outstanding producers were the No. 1 strip mine (Callihan & Callihan Coal Co.) and Osborne No. 2 strip mine (Osborne Mining Co., Inc.).

**Laurel.**—Output of coal from 16 mines was 180,000 tons. The leading producer was the No. 1 strip mine (Laurel Mountain Coal Co.).

465877—58——33

Digitized by Google

**Lawrence.**—Big Block Coal Co. (No. 1 mine) and Milt Robinet Coal Co. (No. 1 mine) produced 25,000 tons of coal—the only output in 1956.

**Lee.**—Four mines produced 85,000 tons of coal; the output of the Pacemaker mine (Congleton Bros., Inc.,) was outstanding. Kentucky Stone Co. (Yellow Rock mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production increased 6 percent over 1955.

**Leslie.**—Coal production from 60 mines totaled 2,780,000 tons; the No. 1 mine (Liberty Coal Co.), No. 6 mine (Kentucky Maid Coal Co.), and No. 3 mine (Kentucky Mountain Coal Co.) were the leading producers.

**Letcher.**—Letcher County ranked fourth in the State in total value of mineral production. Coal production was 6,134,000 tons, and 275 mines were active. The principal producers were the Nos. 21 and 22 mines (Bethlehem Mines Corp.), Big Chief mine (South East Coal Co.), and Lynch No. 31 mine (United States Steel Corp.). Hurricane Gap Quarries, Inc., and Levisa Stone Corp. (Jenkins quarry) crushed 190,000 tons of limestone for concrete aggregate, roadstone, and asphalt filler.

**Livingston.**—Franklin Limestone Co. (Barrett's quarry) and Reed Crushed Stone Co., Inc. (Grand Rivers quarry), produced limestone for riprap, concrete aggregate, roadstone, railroad ballast, and agstone; production dropped 8 percent below 1955. Fluorspar was produced by Black Mining Co., Calvert City Chemical Co. (Dyer's Hill mine), Marimex Fluorspar Co. (Mineral Ridge mine), Boyce Moody (Klondyke mine), Roberts & Frazer, and Tinsley & Loyd (Nancy Hanks mine); the output totaled 9,650 tons. Calvert City Chemical Co. opened a new mine in 1956 and recovered 417 tons of zinc, 228 tons of lead, and 31 fine ounces of silver from fluorspar milled at its Mexico mill.[3]

**Logan.**—Kentucky Stone Co. (Russellville mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production decreased 11 percent below 1955. Kentucky Flagstone Co. (Lewisburg quarry), and Kentucky Kolor Stone Corp. (Russellville quarry) produced 1,800 tons of dimension sandstone for rubble and rough architectural building stone and for flagging.

**Madison.**—Kentucky Stone Co. (Boonesboro mine) crushed limestone for concrete aggregate, roadstone, and agricultural stone; production increased 10 percent over 1955. Cornelison Pottery Co. and Etta Grinstead mined 115 tons of miscellaneous clay for art pottery.

**Magoffin.**—Coal output was 3,900 tons; the only producers were J. L. & Calloway Adams (Adams No. 1 mine) and Tip Top Coal Co. (No. 1 mine).

**Marion.**—Lebanon Stone Co. and Ward & Montgomery crushed 146,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Marshall.**—The State highway department mined 48,000 tons of paving gravel.

**Martin.**—Five mines produced 45,000 tons of coal in 1956. The output of No. 2 mine (Webbs Coal & Mining Co.) was largest.

[3] Pit and Quarry, Fluorspar Demands of Pennsalt Plant Met by New Mine, Expanded Mill: Vol. 49, No. 4, October 1956, pp. 71–74.

Digitized by Google

**Mason.**—J. F. Hardymon Co. mined 33,000 tons of structural and paving sand and 15,000 tons of structural gravel.

**McCracken.**—Federal Materials Co., Inc., Floyd Keeling, McCracken County Highway Department, and Smiley Sand & Gravel Co. produced 262,000 tons of structural, paving, and engine sands and structural and paving gravels.

**McCreary.**—Coal output totaled 613,000 tons from 17 mines in 1956. The No. 18 mine (Stearns Coal & Lumber Co.) and Holly Hill & Hayes Creek strip mines (R. B. Campbell & Son Coal Co., Inc.) were the principal producers. Thomas C. Mayne (Day Ridge quarry) quarried 50 tons of dimension sandstone for rough construction building stone and crushed 60 tons of sandstone for concrete aggregate and roadstone.

**Meade.**—Kosmos Portland Cement Co. and Owensboro River Sand & Gravel Co. produced limestone for cement, concrete, aggregate, roadstone, and agstone; output increased 45 percent over 1955, owing to initial production by Owensboro River Sand & Gravel Co.

**Menifee.**—A. W. Walker & Son (Frenchburg quarry) crushed 76,000 tons of limestone for concrete aggregate, roadstone and agstone.

**Mercer.**—Mercer County Highway Department and Mercer Stone Co. crushed 82,000 tons of limestone for concrete aggregate, roadstone, and fertilizer filler.

**Metcalf.**—Montgomery & Co. (Chapman quarry) crushed 59,000 tons of limestone for concrete aggregate, roadstone, and agstone.

**Monroe.**—Trico Stone, Inc., crushed limestone for concrete aggregate, roadstone, and agstone; production rose 33 percent over 1955.

**Morgan.**—Seven mines in Morgan County produced 93,000 tons of coal; the No. 1 strip mine (Andrew Reed Coal Co.) had the largest output. Kentucky Road Oiling Co. (Wrigley quarry) and Licking River Limestone Co. (Zag quarry) crushed 166,000 tons of limestone for concrete aggregate, roadstone, agstone, and other uses.

**Muhlenburg.**—Coal production was 6,935,000 tons, and 27 mines were active. The leading producers were Paradise strip mine (Pittsburgh & Midway Coal Mining Co.), Crescent mine (Nashville Coal Co., Inc.), Gibraltar strip mine (Gibraltar Coal Corp.), and Skibo strip mine (W. G. Duncan Coal Co.). Greenville Quarries, Inc., and Luzerne Limestone Quarry, Inc., crushed limestone for concrete aggregate, roadstone and agstone; production more than doubled that in 1955.

**Nelson.**—Geoghegan & Mathis produced 159,000 tons of limestone for concrete aggregate and roadstone.

**Ohio.**—Output of coal was 2,811,000 tons from 14 mines. The Ken strip mine (Peabody Coal Co.), and No. 1 strip mine (Riverview Coal Co.) were the outstanding producers. Fort Hartford Stone Quarry crushed 209,000 tons of limestone for riprap, concrete aggregate, roadstone, railroad ballast, and agstone.

**Oldham.**—W. T. Liter opened the Crestwood mine and produced 100,000 tons of limestone for concrete aggregate and roadstone.

**Owsley.**—The only producers—Joe Reynolds Coal Co. (No. 1 mine) and Corbet Sizemore Coal Co. (No. 2 mine)—mined 13,900 tons of coal in 1956.

Digitized by Google

**Lawrence.**—Bi... Falmouth quarries) Coal Co. (No. 1 ... aggregate roadstone. in 1956.

**Lee.**—Four ... tons and 136 mines were Pacemaker ... and the Blue Diamond tucky Stone ... the Blair Fork mine (Jewell aggregate, ... increased 6 ... State in total value of

**Leslie.**— ... 9,046,000 tons from 391 No. 1 mi ... Stone mine (Eastern Coal Co.), and ... Elkhorn Coal Co.), Republic producer ... Feds Creek mine (Feds Creek Coal

**Letch** ... Whitecock quarry) crushed 112,000 of mine ... aggregate, roadstone, and agstone. mines ... No. 1 mine) mined miscellaneous mines ... Co.), ... 349,000 tons of coal in 1956. Gap ... Coal Co.) and Wildcat No. 1 mine 190,( ... producers. Somerset Stone aspl ... Co. crushed limestone for concrete

**I** ... production in 1956 was 19 percent Cr ... for ... 147,000 tons; and 10 mines were ag ... H & W Lumber Co., Inc.) was the p ... Stone Co. (Mt. Vernon quarry and ... for concrete aggregate, roadstone, ... production was 11 percent below that

... Co. (Christy quarry) and Morehead ... tons of limestone for fluxing stone, ... and agstone. Lee Clay Products Co. ... miscellaneous clay for heavy clay prod- ... percent over 1955.

... Inc. (Franklin quarry), produced ... for concrete aggregate, roadstone, and ...

... Gallatin quarry) and Kentucky Stone Co. ... tons of limestone for concrete aggregate, ...

... 2,267,000 tons from 5 mines; of ... Nashville Coal Co., Inc.) and Poplar ... were the leading producers. The State ... Sand & Gravel Co. (Morganfield ... and 34,300 tons of struc- ... Products Co., Uniontown mine) produced ... clay or heavy clay products.

... Stone Co. crushed 98,000 tons of limestone for ... and agstone.

... 55,000 tons of coal in 1956. The ... Coal Co.) had the largest output. ... 75,000 tons of limestone for concrete ... and agstone.

Digitized by Google

**Webster.**—Coal production totaled 1,217,000 tons from 14 mines. The Precision Washed strip mine (Hart & Hart Coal Co.) was the principal producer.

**Whitley.**—Output of coal from 41 mines was 344,000 tons. The Whitley strip mine (Whitley Strip Mining Co., Inc.) and No. 3 mine (Reaves Dixie Gem Coal Co.) were the leading producers. Corbin Brick Co. mined 13,000 tons of miscellaneous clay for heavy clay products.

**Wolfe.**—David Day Coal Co. (No. 1 mine) and C. L. Thompson Coal Co. (Miller mine) produced 7,250 tons of coal, the only output in 1956.

Digitized by Google

**Pendleton.**— Geoghegan
crushed 263,000 tons of
**Perry.**— Coal product
active. The Leatherw
mine (Blue Diamon
Ridge Coal Corp.) w
**Pike.**—Pike Co
mineral output.
mines. The p
Corp.), Kentl
mine (Repu
Co. Inc.).
**Powell.**
tons of
H. B. S
clay fo
Pul
The
(Fo
C
a
l

Digitized by Google

# The Mineral Industry of Louisiana

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Louisiana Geological Survey.

By Howard E. Rollman [1] and Leo Hough [2]

AN INFLUX of industry began converting the old plantations along the Mississippi River between Baton Rouge and New Orleans into new industrial sites. The river, as a source of fresh water and a means of low-cost transportation, combined with abundant industrial mineral raw materials to create a favorable economic environment for this development.

Chemical and metals industries were most active in the new expansion. Ample industrial processing and cooling water and cheap water transportation were economically important to these industries. Present and planned alumina and nickel-cobalt plants along the river channel were to use ores from the Caribbean area. Shipping facilities provided efficient handling of ores, alumina, and finished metal. The chemical industry, producing bulk intermediate products requiring further distribution, also was located with transportation costs and access in mind. Chemical plants were also attracted by the available chemical raw materials and fuels. The location of the Mississippi River, in relation to access to the northern industrial areas and to foreign imported materials, gives a flexibility to the new evolving economic pattern in the State.

In 1956 intensive activity in offshore oil and gas exploration and development continued; a new cement plant, gypsum-processing plant, and barite-grinding plant, were being constructed; large sulfur deposits, were being developed and opening of 2 new salt domes was planned.

Except for gypsum, the output of minerals in Louisiana during 1956 was greater than in the previous year. The total value of all minerals increased 10 percent. Greater total values of natural gas, petroleum, and natural-gas liquids largely explained the growth.

The Suez crisis had its first impact on the petroleum industry of Louisiana during the last few months of 1956. Marketed production of natural gas—the second largest of any State—was 12 percent higher than 1955. Mineral fuels comprised 91 percent of the total value of all minerals produced. Recovery of other minerals, however,

[1] Commodity-industry economist, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] State geologist, Louisiana Geological Survey, Baton Rouge, La.



Digitized by Google

was sizable. In 1956 Louisiana produced nearly 40 percent of the Nation's sulfur shipments; was the fourth largest in salt recovery; and produced 4 million tons of shell, 9.8 million tons of sand and gravel, as well as large tonnages of clays, cement, and lime.

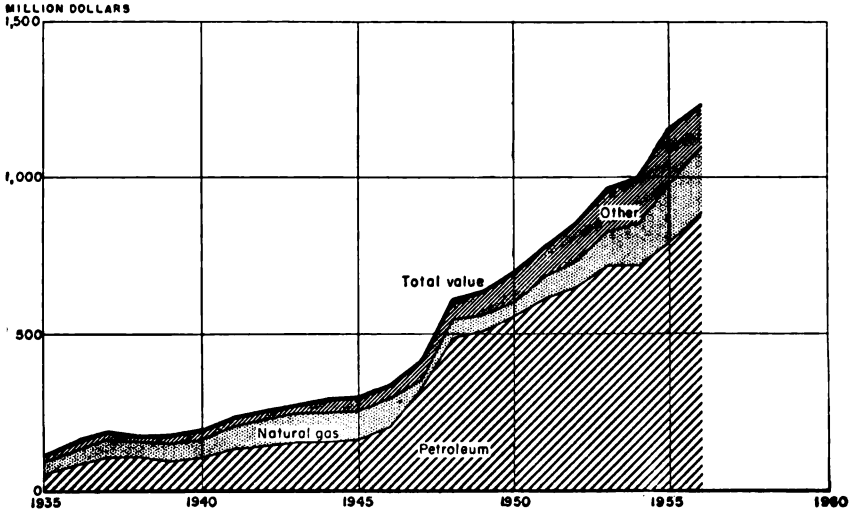



FIGURE 1.—Value of crude petroleum, natural gas, and total value of mineral production in Louisiana, 1935–56.

**TABLE 1.—Mineral production in Louisiana, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays [2] | 651, 268 | $659, 099 | 785, 283 | $785, 283 |
| Gypsum | 335, 371 | 586, 900 | 275, 984 | 598, 000 |
| Natural gas ..... million cubic feet | 1, 680, 032 | 189, 844, 000 | 1, 886, 302 | 215, 038, 000 |
| Natural-gas liquids: | | | | |
| Natural gasoline and cycle products ..... thousand gallons | 782, 328 | 59, 158, 000 | 773, 949 | 62, 394, 000 |
| LP-gases ..... do | 291. 138 | 10, 323, 000 | 305, 222 | 14, 727, 000 |
| Petroleum (crude) .. thousand 42-gallon barrels | 271, 010 | 793, 280. 000 | 299, 421 | 877, 951, 000 |
| Salt (common) | 3, 562, 636 | 15, 406. 993 | 3, 703. 500 | 17, 695. 270 |
| Sand and gravel | 8, 574. 020 | 10, 941, 860 | 9, 832, 443 | 12, 158, 428 |
| Stone [3] | 3, 252, 585 | 4, 961. 657 | 4, 405. 000 | 6, 674, 000 |
| Sulfur (Frasch process) ..... long tons | 2, 072, 418 | 58, 027, 704 | 2, 238, 852 | 59, 329, 579 |
| Value of items that cannot be disclosed: Bentonite, cement, lime, recovered elemental sulfur | ---------- | 15, 308, 896 | ---------- | 16, 562, 656 |
| Total Louisiana [4] | ---------- | 1, 156, 637, 000 | ---------- | 1, 281, 849, 000 |

[1] Production is measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes bentonite; value included with items that cannot be disclosed.
[3] Includes 3,220,928 short tons of oystershell valued at $4,930,000 in 1955 and 4,364,067 short tons of oystershell valued at $6,633,385 in 1956.
[4] Total value has been adjusted to avoid duplicating value of clays used for cement and oystershell used in producing lime and cement.

**Employment.**—Employment in oil and gas fields and in quarries, pits, and mines and on dredges increased 10 percent in 1956 compared with 1955. Nine-tenths of the labor force in the mineral industry

Digitized by Google

was engaged in producing petroleum, natural gas, and natural-gas liquids. The number of workers in this activity increased 10 percent; the number in nonmetallic production increased 8 percent. In the 3-year period 1954–56, the increased mining activity resulted in an economic gain to the State of $62 million and a total payroll of $233 million in 1956.

The average annual wage for oil and gas labor advanced 6 percent, to $5,342; for nonmetals the increase was 6 percent, to an average of $4,389.

In all phases of petroleum production, refining, and all the related industries employment increased 6,650 over 1955.

In all nonmetal-mining operations in Louisiana during 1956 there were 4 fatal and 73 nonfatal injuries. The injury rate was 1 fatal injury for every 1,185,000 man-hours and 1 nonfatal injury for every 65,000 man-hours.

**TABLE 2.—Employment and wages in the mineral industries, 1955–56** [1]

| Activity | Average number of workers | | Total wages and salaries | |
|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 [2] |
| Crude-petroleum production (including associated natural-gas production) | 18,694 | 19,660 | $101,831,895 | $113,334,000 |
| Natural gas and natural-gas liquids | 1,352 | 1,333 | 6,475,229 | 6,537,000 |
| Oil- and gas-field contract services | 16,199 | 18,993 | 74,693,801 | 93,742,000 |
| Sand and gravel quarries, pits, and dredges | 1,319 | 1,491 | 4,101,402 | 4,777,000 |
| Salt mines | 1,014 | 980 | 3,771,595 | 3,806,000 |
| Nonmetallic minerals [3] | 1,710 | 1,911 | 8,958,155 | 10,650,000 |
| Total | 40,288 | 44,368 | 199,171,077 | 232,846,000 |

[1] Louisiana Department of Labor.
[2] Preliminary.
[3] Mainly sulfur- and shell-production workers.

**TABLE 3.—Total wage and salaried workers in petroleum production, refining, and related industries, 1947–51 (average) and 1952–56** [1]

| Year | Crude petroleum and natural-gas production | Petroleum refining | Pipeline transportation (except natural gas) | Gas utilities | Petroleum bulk tank stations | Retail filling stations | Chemicals manufactured as byproducts of petroleum or used in refining petroleum | Total |
|---|---|---|---|---|---|---|---|---|
| 1947–51 (average) | 22,362 | 15,271 | 1,430 | 3,878 | 3,059 | 4,666 | 8,382 | 59,048 |
| 1952 | 26,442 | 16,039 | 1,544 | 4,660 | 3,157 | 5,572 | 9,688 | 67,102 |
| 1953 | 28,450 | 15,900 | 1,500 | 4,900 | 3,500 | 6,250 | 10,350 | 70,850 |
| 1954 | 31,900 | 15,850 | 1,450 | 4,950 | 3,650 | 6,600 | 10,600 | 75,000 |
| 1955 | 35,900 | 15,800 | 1,450 | 5,100 | 3,900 | 7,400 | 11,350 | 80,900 |
| 1956 [2] | 40,200 | 15,500 | 1,400 | 5,600 | 4,400 | 8,400 | 12,050 | 87,550 |

[1] Louisiana State Department of Labor.
[2] Preliminary figures.

Digitized by Google

# REVIEW OF MINERAL COMMODITIES

## MINERAL FUELS

Recovery of mineral fuels continued its steady increase to meet the ever-growing energy requirements of the Nation. In 1956 the quantity of energy fuels produced in Louisiana was equal to energy consumption in the United States in 1900. In addition to the impetus of the oil-rich offshore provinces, curtailment of Middle East oil by the Suez crisis began to show effect in Louisiana. In the latter part of the year production allowables for the State were raised by the Department of Conservation to help fill the world need for oil. These increased allowables enabled Louisiana to press California for the position of second-ranking producing State during December.

According to the Louisiana Department of Conservation, at the end of 1956 there were 756 oil and/or gas fields with over 24,000 wells capable of producing oil or gas. Exploratory drilling resulted in discovery of 79 new fields.

**TABLE 4.—Production of crude petroleum and natural gas in the Louisiana offshore area, 1956 and cumulative total [1]**

| Area | 1956 | | Cumulative total | |
|---|---|---|---|---|
| | Crude petroleum (barrels) | Natural gas (million cubic feet) | Crude petroleum (barrels) | Natural gas (million cubic feet) |
| Bay Marchand | 3,431,414 | 2,345 | 17,193,525 | 11,855 |
| Brenton Sound | 489,413 | 8,213 | 1,765,498 | 18,032 |
| Chandeleur Sound | 53,371 | 59 | 164,612 | 110 |
| Eugene Island | 4,656,755 | 54,742 | 12,998,660 | 201,055 |
| Grand Isle | 1,983,526 | 1,256 | 5,922,187 | 3,540 |
| Main Pass | 8,560,954 | 12,079 | 30,306,003 | 33,936 |
| Ship Shoal | 627,391 | 518 | 2,336,385 | 2,106 |
| South Pass | 18,261,055 | 19,036 | 35,390,539 | 33,558 |
| South Pelto | 105,358 | 159 | 152,933 | 206 |
| South Timbalier | 52,436 | 31 | 261,644 | 163 |
| Vermilion | 183,105 | 35,775 | 610,137 | 121,369 |
| West Cameron | 282,074 | 390 | 872,250 | 1,816 |
| West Delta | 2,219,116 | 1,924 | 3,660,461 | 3,060 |
| Total | 40,906,000 | 136,527 | 111,635,000 | 430,806 |

[1] Louisiana Department of Conservation, Annual Oil and Gas Report: 1956, pp. 64–68.

**TABLE 5.—Revenue from oil and gas mineral leases on Louisiana submerged lands, 1947–56 [1]**

| Year | Rentals | Bonuses | Royalty | Year | Rentals | Bonuses | Royalty |
|---|---|---|---|---|---|---|---|
| 1947 | $2,275,599 | $8,676,522 | | 1952 | $1,026,869 | $8,933,573 | $136,890 |
| 1948 | 5,573,631 | 11,866,375 | $32,524 | 1953 | 1,300,176 | 3,766,110 | 3,576,812 |
| 1949 | 7,663,728 | | 273,814 | 1954 | 2,091,481 | 36,302,875 | 3,983,146 |
| 1950 | 3,941,764 | 1,340,590 | 941,800 | 1955 | 1,553,069 | 44,212,535 | 5,839,623 |
| 1951 | 867,455 | 4,087,286 | 319,959 | 1956 | 1,260,145 | 15,951,512 | 6,342,202 |

[1] Louisiana State Land Office.

**Exploration and Reserves.**—In 1956 South Louisiana was one of the most successful areas in the Nation for oil and gas exploration. Favorable achievements in the offshore areas continued to encourage operators. Success in the deep-drilling programs in the inland areas

Digitized by Google

offered unforeseen potentials in the areas previously neglected by shallower drilling programs. As a result of exploratory activity, there was a net gain in reserves of 420 million barrels of crude petroleum, 79 million barrels of natural-gas liquids, and 2,618 million cubic feet of natural gas by the end of 1956. Total reserves were 3,675 million barrels of oil, 45,054 billion cubic feet of gas, and 1,015 million barrels of natural-gas liquids.

The 420-million-barrel net increase in crude-petroleum reserves developed in Louisiana represented 99 percent of the net increase for the Nation. About 20 percent of Louisiana's crude-petroleum reserve was developed in the offshore area. At the end of 1956 the ratio of reserves to production was 13.61:1.00—the second best of the major oil-producing States in the Nation. The decreasing ratio of the gas reserves to production was stemmed in 1956 by the large, new gas-reserve development. The likely impact of new gas reservoir discoveries in the Gulf areas was not yet fully evaluated. Newly discovered offshore gas wells were shut in because of the inability to market the gas from these wells in inland pipelines. The ratio of gas reserve to production in 1956 was 24.24:1. An estimate based on comparable inland occurrences placed Louisiana's undeveloped offshore reserves at 21.5 trillion cubic feet.[3]

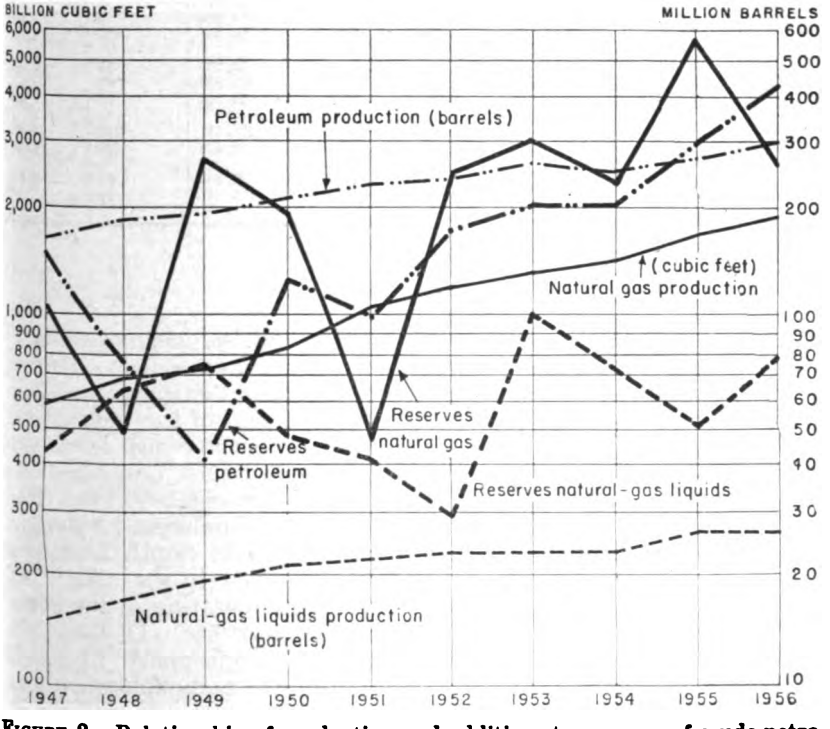



FIGURE 2.—Relationship of production and additions to reserves of crude petroleum, natural gas, and natural-gas liquids, in Louisiana, 1947–56.

[3] Atwater, Gordon, Future of Offshore Province, Bulletin of American Association of Petroleum Geologists, vol. 40, No. 11, November, 1956, pp. 2624–2635.

Digitized by Google

**TABLE 6.—Reserves of crude petroleum, natural gas, and natural-gas liquids, 1955–56 [1]**

| Fuel | Proved reserves as of Dec. 31 | | | Increase, percent |
|---|---|---|---|---|
| | 1955 | 1956 | Change in reserves | |
| Crude petroleum [2] | 3,255 | 3,675 | 420 | 13 |
| Natural-gas liquids [2] | 936 | 1,015 | 79 | 8 |
| Natural gas [3] | 42,436 | 45,054 | 2,618 | 6 |

[1] American Gas Association and American Petroleum Institute, Proved Reserves of Crude Oil, Natural-Gas Liquids, and Natural Gas: Vol. 11, Dec. 31, 1956, pp. 9, 10, and 19.
[2] Million barrels.
[3] Billion cubic feet.

**TABLE 7.—Estimated reserves in the offshore area [1]**

| Field | Estimated reserves (thousand barrels) | Number wells | Acres [2] |
|---|---|---|---|
| Bay Marchand [3] | 67,811 | 87 | 3,480 |
| Belle Isle [3] | 17,958 | 21 | 840 |
| Breton Sound: Block 20 | 8,651 | 10 | 400 |
| Eugene Island: | | | |
| Block 18 and 32 | 19,993 | 25 | 1,000 |
| Block 126 | 49,618 | 52 | 2,080 |
| Block 128 | 8,534 | 9 | 360 |
| Grande Isle: Block 18 | 20,591 | 26 | 1,040 |
| Main Pass: | | | |
| Block 35 | 76,704 | 74 | 2,960 |
| Block 69 [4] | 102,334 | 93 | 3,720 |
| Ship Shoal: Block 154 | 14,540 | 15 | 600 |
| South Pass: | | | |
| Block 24 [3 4] | 278,511 | 312 | 4,160 |
| Block 27 | 25,708 | 28 | 1,120 |
| West Delta: | | | |
| Block 30 | 33,360 | 35 | 1,400 |
| Block 53 | 9,241 | 11 | 440 |

[1] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 161.
[2] Figures under "Acres" apply to largest reservoir only.
[3] Includes onshore production.
[4] Estimated ultimate recovery of 100 million barrels or more.

Of the approximate 36,000 wells drilled for oil and gas in Louisiana from 1937 to 1955, about 14 percent were wildcat wells. Of these wildcats, 7.7 percent were productive in North Louisiana and 20.5 percent in South Louisiana. In 1956, 13.9 percent of the wells drilled for oil and gas in North Louisiana and 20.8 percent in South Louisiana were wildcats. The percentage of wildcats in South Louisiana was one of the highest in the Nation. In South Louisiana in 1956, 18.5 percent of the wildcats were productive, in North Louisiana 7.8 percent were productive. The increasing success ratio in South Louisiana explains in part the extensive exploratory activity in the area.[4] At the end of 1956, 424 rotary-drilling rigs were operating in the State as compared with 406 in 1955, a 4-percent increase. Of these, 69 operated in North Louisiana and 355 in South Louisiana.[5] Although the total number of wells drilled for development and exploration was about the same as in the previous year, the number of wildcats in 1956 was about one-third more than in 1955.

[4] World Oil, vol. 144, No. 3, Feb. 15, 1957, p. 124.
[5] Work cited footnote 4, p. 162.

Digitized by Google

**TABLE 8.—Oil and gas well drilling in 1956, by parishes [1]**

| Parish | Proved field wells | | | Exploratory wells | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oil | Gas | Dry | Oil | Gas | Dry | Oil | Gas | Dry |
| Acadia | 16 | 21 | 14 | 5 | 9 | 25 | 21 | 30 | 39 |
| Allen | 6 | 12 | 8 | 1 | 2 | 19 | 7 | 14 | 27 |
| Ascension | 3 | ---- | 2 | 1 | 1 | 3 | 4 | 1 | 5 |
| Assumption | 1 | 4 | 2 | 2 | 2 | 10 | 3 | 6 | 12 |
| Avoyelles | ---- | ---- | 1 | 1 | ---- | 3 | 1 | ---- | 4 |
| Beauregard | 36 | 3 | 11 | 6 | 1 | 32 | 42 | 4 | 43 |
| Bienville | 6 | 7 | 4 | 1 | ---- | 4 | 7 | 7 | 8 |
| Bossier | 31 | 9 | 15 | 4 | ---- | 18 | 35 | 9 | 33 |
| Caddo | 555 | 23 | 35 | 1 | 1 | 9 | 556 | 24 | 44 |
| Calcasieu | 31 | 11 | 18 | 3 | 9 | 25 | 34 | 20 | 43 |
| Caldwell | ---- | ---- | ---- | ---- | ---- | 3 | ---- | ---- | 3 |
| Cameron | 50 | 21 | 16 | 3 | 7 | 33 | 53 | 28 | 49 |
| Catahoula | 18 | ---- | 15 | 4 | ---- | 18 | 22 | ---- | 33 |
| Claiborne | 25 | 2 | 12 | 8 | 1 | 3 | 33 | 3 | 15 |
| Concordia | 12 | ---- | 18 | 1 | ---- | 32 | 13 | ---- | 50 |
| De Soto | 26 | 25 | 34 | 2 | 1 | 9 | 28 | 26 | 43 |
| East Baton Rouge | 1 | ---- | 1 | ---- | ---- | 2 | 1 | ---- | 3 |
| Evangeline | 5 | ---- | 1 | ---- | ---- | 7 | 5 | ---- | 8 |
| Franklin | 12 | 1 | 15 | 3 | ---- | 9 | 15 | 1 | 24 |
| Grant | 8 | ---- | 2 | ---- | ---- | ---- | 8 | ---- | 2 |
| Iberia | 30 | 6 | 12 | 7 | 3 | 14 | 37 | 9 | 26 |
| Iberville | 29 | 2 | 10 | 2 | 3 | 17 | 31 | 5 | 27 |
| Jackson | ---- | ---- | ---- | ---- | ---- | 1 | ---- | ---- | 1 |
| Jefferson | 17 | ---- | 4 | 9 | 3 | 14 | 26 | 3 | 18 |
| Jefferson Davis | 5 | 9 | 7 | 2 | 6 | 14 | 7 | 15 | 21 |
| Lafayette | 1 | 4 | 1 | 1 | 3 | 2 | 2 | 7 | 3 |
| Lafourche | 68 | 24 | 19 | 8 | 15 | 47 | 76 | 39 | 66 |
| La Salle | 38 | ---- | 17 | 2 | ---- | 8 | 40 | ---- | 25 |
| Lincoln | ---- | 4 | 1 | ---- | ---- | 1 | ---- | 4 | 2 |
| Madison | ---- | ---- | ---- | ---- | ---- | 3 | ---- | ---- | 3 |
| Morehouse | ---- | 5 | ---- | ---- | ---- | 3 | ---- | 5 | 3 |
| Natchitoches | 1 | ---- | 1 | ---- | ---- | 4 | 1 | ---- | 5 |
| Orleans | ---- | ---- | ---- | ---- | ---- | 1 | ---- | ---- | 1 |
| Ouachita | ---- | 1 | 1 | ---- | ---- | 1 | ---- | 1 | 2 |
| Plaquemines | 101 | 3 | 17 | 11 | 5 | 35 | 112 | 8 | 52 |
| Pointe Coupee | 2 | ---- | ---- | 1 | ---- | 4 | 3 | ---- | 4 |
| Rapides | ---- | ---- | 5 | ---- | ---- | 4 | ---- | ---- | 9 |
| Red River | 1 | ---- | 5 | ---- | ---- | 10 | 1 | ---- | 15 |
| Richland | 6 | 3 | 6 | ---- | ---- | 3 | 6 | 3 | 9 |
| Sabine | 4 | 1 | 15 | 2 | ---- | 14 | 6 | 1 | 29 |
| St. Charles | 7 | 1 | 4 | 1 | 5 | 17 | 8 | 6 | 21 |
| St. James | 2 | 1 | ---- | ---- | ---- | 7 | 2 | 1 | 7 |
| St. Landry | 21 | 8 | 14 | 1 | 6 | 13 | 22 | 14 | 27 |
| St. Martin | 38 | 7 | 26 | 4 | 11 | 15 | 42 | 18 | 41 |
| St. Mary | 43 | 13 | 13 | 5 | 1 | 16 | 48 | 14 | 29 |
| St. Tammany | ---- | ---- | ---- | ---- | 1 | 1 | ---- | 1 | 1 |
| Tangipahoa | ---- | ---- | ---- | ---- | ---- | 1 | ---- | ---- | 1 |
| Tensas | 23 | 2 | 9 | 2 | 1 | 21 | 25 | 3 | 30 |
| Terrebonne | 61 | 15 | 13 | 12 | 9 | 43 | 73 | 24 | 56 |
| Union | 1 | 57 | 1 | ---- | 1 | 9 | 1 | 58 | 10 |
| Vermilion | 12 | 16 | 7 | 1 | 10 | 12 | 13 | 26 | 19 |
| Vernon | ---- | ---- | ---- | ---- | ---- | 1 | ---- | ---- | 1 |
| Webster | 58 | 4 | 15 | 3 | 2 | 4 | 61 | 6 | 19 |
| West Baton Rouge | ---- | ---- | ---- | ---- | ---- | 6 | ---- | ---- | 6 |
| West Carroll | ---- | 2 | 3 | ---- | ---- | ---- | ---- | 2 | 3 |
| West Feliciana | ---- | ---- | ---- | ---- | ---- | 1 | ---- | ---- | 1 |
| Winn | 11 | ---- | 9 | ---- | ---- | 4 | 11 | ---- | 13 |
| Gulf of Mexico: | | | | | | | | | |
| Bay Marchand | 21 | 1 | 7 | ---- | 3 | 3 | 21 | 4 | 10 |
| Breton Sound | 3 | ---- | 2 | ---- | ---- | 3 | 3 | ---- | 5 |
| Chandeleur Sound | ---- | ---- | ---- | ---- | ---- | 1 | ---- | ---- | 1 |
| East Cameron | ---- | 2 | ---- | ---- | 2 | ---- | ---- | 4 | ---- |
| Eugene Island | 25 | ---- | 6 | 7 | 3 | 1 | 32 | 3 | 7 |
| Grand Isle | 12 | ---- | 14 | 3 | 1 | 1 | 15 | 1 | 15 |
| Main Pass | 39 | 4 | 5 | ---- | 5 | 2 | 39 | 9 | 7 |
| Ship Shoal | 9 | 5 | 21 | 3 | 2 | 5 | 12 | 7 | 26 |
| South Pass | 88 | 11 | 18 | ---- | 5 | 12 | 88 | 16 | 30 |
| South Pelto | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | 1 |
| South Timballer | 1 | 1 | 1 | 2 | ---- | 2 | 3 | 1 | 3 |
| Vermillion | ---- | 7 | 2 | ---- | 4 | 5 | ---- | 11 | 7 |
| West Cameron | 3 | 12 | 6 | ---- | 2 | 2 | 3 | 14 | 8 |
| West Delta | 31 | 6 | 13 | 6 | ---- | 2 | 37 | 6 | 15 |
| Total, Gulf of Mexico | 232 | 49 | 96 | 21 | 27 | 39 | 253 | 76 | 135 |
| Total: 1956 | 1,654 | 376 | 555 | 141 | 146 | 674 | 1,795 | 522 | 1,229 |
| 1955 | 2,317 | 406 | 692 | 104 | 74 | 534 | 2,421 | 480 | 1,226 |

[1] National Oil Scouts and Landmen's Association, Oil- and Gas-Field Development in United States: Austin, Tex., vol. 27, 1957.

Digitized by Google

**TABLE 9.—New oil and gas discoveries, 1956, by parishes [1]**

| Parish | Field | Section | Township | Range | Date of discovery | Product |
|---|---|---|---|---|---|---|
| **NORTH LOUISIANA** | | | | | | |
| Bossier | Alden Bridge | 9 | 20 N. | 13 W. | June 21 | Oil. |
| Do. | Bolinger | 34 | 23 N. | 13 W. | Nov. 18 | Do. |
| Do. | Crossway Bayou | 27 | 21 N. | 12 W. | July 22 | Do. |
| Caddo | Metcalf | 21 | 16 N. | 16 W. | June 15 | Gas. |
| Catahoula | Patten Church | 24 | 8 N. | 6 E. | Nov. 18 | Oil. |
| Do. | Tew Lake | 11 | 8 N. | 6 E. | June 6 | Do. |
| Claiborne | Northwest Colquitt | 21 | 23 N. | 6 W. | Oct. 15 | Do. |
| Franklin | Baskinton | 28 | 16 N. | 8 E. | July 16 | Do. |
| Do. | Turkey Creek | 16 | 15 N. | 8 E. | Aug. 25 | Do. |
| Do. | West Baskinton | 36 | 16 N. | 7 E. | Oct. 24 | Do. |
| LaSalle | Sandy Bayou | 13 | 5 N. | 3 E. | July 26 | Do. |
| Sabine | Kilgore Slough | 20 | 9 N. | 14 W. | June 19 | Do. |
| Tensas | Justine | 24 | 12 N. | 10 E. | Dec. 9 | Gas. |
| Do. | Lake Formosa | 22 | 12 N. | 10 E. | Oct. 18 | Oil. |
| Union | Bull Creek | 20 | 21 N. | 3 W. | Oct. 9 | Gas. |
| **SOUTH LOUISIANA** | | | | | | |
| Acadia | South Mermentau | 69 | 10 S. | 2 W. | Dec. 28 | Gas. |
| Do. | South Rayne | 17 | 10 S. | 2 E. | May 18 | Do. |
| Allen | Cane Brake | 32 | 5 S. | 6 W. | July 10 | Oil. |
| Beauregard | Fulton | 34 | 6 S. | 8 W. | Sept. 21 | Do. |
| Do. | Shoats Creek | 10 | 7 S. | 12 W. | Feb. 25 | Gas. |
| Calcasieu | Coulee Hippolyte | 33 | 10 S. | 8 W. | Feb. 19 | Oil. |
| Do. | North Chalkley | 29 | 11 S. | 6 W. | July 3 | Gas. |
| Do. | West Holmwood | 29 | 10 S. | 7 W. | May 29 | Do. |
| Cameron | Calcasieu Pass | 29 | 15 S. | 10 W. | Oct. 28 | Do. |
| Do. | East Cameron Block 62 | Offshore | | | Jan. 22 | Do. |
| Do. | East Cameron Block 160 | do. | | | Sept. 21 | Do. |
| Do. | Grosse Savanne | 33 | 12 S. | 8 W. | Jan. 27 | Oil. |
| Do. | Kings Bayou | 3 | 15 S. | 7 W. | Mar. 26 | Gas. |
| Do. | West Chenière Perdue | 16 | 14 S. | 7 W. | Sept. 9 | Do. |
| Iberia | Bayou Postillion | 35 | 12 S. | 11 E. | Jan. 3 | Oil. |
| Do. | Big Bayou Pigeon | 30 | 12 S. | 11 E. | Jan. 17 | Do. |
| Do. | East Bayou Pigeon | 15 | 12 S. | 11 E. | Dec. 5 | Gas. |
| Do. | Eugene Island Block 47 | Offshore | | | Mar. 4 | Do. |
| Jefferson | Grand Isle Block 43 | do. | | | Oct. 28 | Do. |
| Do. | Marrero | 44 | 14 S. | 24 E. | Aug. 2 | Do. |
| Do. | McCall's Island | 14 | 18 S. | 23 E. | Dec. 16 | Oil. |
| Do. | South Little Lake | | 18 S. | 23 E. | Apr. 5 | Do. |
| Do. | Three Bayou Bay | 7 | 18 S. | 24 E. | July 9 | Gas. |
| Do. | West Pontchartrain | | | | July 26 | Do. |
| Jefferson Davis | Fontenot | 27 | 7 S. | 5 W. | Apr. 16 | Do. |
| Lafayette | Ossum | 13 | 9 S. | 3 E. | Nov. 15 | Oil. |
| Do. | Southeast Rayne | 11 | 10 S. | 2 E. | June 1 | Gas. |
| Lafourche | Bayou Raphael | 39 | 19 S. | 22 E. | Oct. 4 | Oil. |
| Do. | Lake Boeuf | 116 | 15 S. | 18 E. | Oct. 20 | Do. |
| Do. | Lake Fields | | 17 S. | 19 E. | July 7 | Gas. |
| Do. | South Timbalier Block 86 | Offshore | | | Dec. 30 | Oil. |
| Do. | South Timbalier Block 135 | do. | | | Dec. 25 | Do. |
| Plaquemines | Bayou Gentilly | 16 | 15 S. | 14 E. | Sept. 13 | Gas. |
| Do. | Dalcour | 44 | 14 S. | 13 E. | June 20 | Oil. |
| Do. | Main Pass Block 46 | Offshore | | | Sept. 18 | Gas. |
| Do. | South Pass Block 20 | do. | | | Feb. 28 | Do. |
| Do. | South Pass Block 21 | do. | | | May 28 | Do. |
| Do. | South Pass Block 42 | do. | | | Apr. 13 | Do. |
| Do. | Tiger's Ridge | 41 | 15 S. | 12 E. | Nov. 8 | Do. |
| Do. | West Delta Block 25 | Offshore | | | Nov. 3 | Oil. |
| Do. | West Delta Block 83 | do. | | | Nov. 14 | Do. |
| Pointe Coupee | Frisco | 8 | 6 S. | 9 E. | July 5 | Oil. |
| St. Charles | Kenner | 39 | 12 S. | 9 E. | Feb. 12 | Gas. |
| Do. | West Pontchartrain | | 11 S. | 9 E. | May 15 | Do. |
| St. Landry | Lawtell | 23 | 6 S. | 3 E. | Nov. 5 | Do. |
| St. Martin | Bayou Crook Chene | 3 | 11 S. | 9 E. | June 6 | Oil. |
| Do. | Cade | 11 | 11 S. | 5 E. | Aug. 23 | Gas. |
| Do. | Cecelia | 63 | 8 S. | 6 E. | Oct. 18 | Oil. |
| Do. | Simon Pass | 22 | 15 S. | 13 E. | June 6 | Gas. |

See footnote at end of table.

Digitized by Google

**TABLE 9.—New oil and gas discoveries, 1956, by parishes [1]—Continued**

| Parish | Field | Section | Township | Range | Date of discovery | Product |
|---|---|---|---|---|---|---|
| | | SOUTH LOUISIANA—Continued | | | | |
| St. Mary | Eugene Island Block 77 | Offshore | | | May 1 | Gas. |
| Do. | Eugene Island Block 175 | do. | | | July 2 | Oil. |
| Do. | Eugene Island Block 184 | do. | | | Mar. 16 | Gas. |
| Do. | Eugene Island Block 188 | do. | | | Oct. 16 | Oil. |
| Do. | Garden City | 61 | 15 S. | 10 E. | Dec. 24 | Gas. |
| Terrebonne | Bayou Ramblo | 12 | 20 S. | 16 E. | Dec. 15 | Do. |
| Do. | Humphreys | 93 | 17 S. | 16 E. | Aug. 10 | Do. |
| Do. | Ship Shoal Block 176 | Offshore | | | Nov. 28 | Do. |
| Do. | South Humphreys | 50 | 17 S. | 15 E. | Dec. 22 | Do. |
| Vermilion | Boston Bayou | 22 | 14 S. | 4 E. | Nov. 10 | Do. |
| Do. | Maurice | 41 | 11 S. | 4 E. | Mar. 28 | Do. |
| Do. | Theall | 2 | 14 S. | 2 E. | Jan. 29 | Do. |
| Do. | Vermilion Block 14 | Offshore | | | July 24 | Do. |
| Do. | Vermilion Block 46 | do. | | | Dec. 10 | Do. |
| Do. | Vermilion Block 66 | do. | | | July 3 | Do. |

[1] Louisiana Department of Conservation, Annual Oil and Gas Report, 1956: Pp. 8–9.

**TABLE 10.—Crew-weeks spent in geophysical and core-drill oil and gas prospecting, by methods [1]**

| Parish | Method | | Parish | Method | |
|---|---|---|---|---|---|
| | Reflection seismograph | Gravity meter | | Reflection seismograph | Gravity meter |
| North Louisiana: | | | South Louisiana (Con.): | | |
| Bienville [2] | 14 | 8 | Jefferson Davis | 163 | 9 |
| Bossier | 80 | | Lafayette | 180 | 3 |
| Caddo | 28 | | Lafourche | 305 | |
| Caldwell | 28 | | Livingston | 23 | |
| Catahoula | 20 | 4 | Orleans | 27 | |
| Claiborne | 91 | | Plaquemines | 340 | |
| DeSoto | 2 | | Pointe Coupee | 56 | |
| East Carroll | 8 | | St. Bernard | 52 | |
| Franklin | 18 | 3 | St. Charles | 61 | |
| Jackson | 7 | | St. Helena | 5 | |
| LaSalle | 10 | | St. James | 40 | |
| Lincoln | 21 | 1 | St. John the Baptist | 81 | |
| Madison | 23 | 11 | St. Landry | 179 | 4 |
| Morehouse | 85 | | St. Martin | 242 | 47 |
| Natchitoches | 3 | 47 | St. Mary | 462 | 17 |
| Ouachita | 33 | | Tangipahoa | 14 | |
| Red River | 10 | | Terrebonne | 651 | |
| Richland | 17 | | Vermilion | 477 | 22 |
| Sabine | 9 | | Vernon | 11 | |
| Tensas | 47 | 7 | West Baton Rouge | 14 | |
| Union | 165 | | Total | 5,175 | 246 |
| Webster | 99 | 8 | | | |
| West Carroll | 13 | | Offshore area: | | |
| Winn | 25 | 7 | Bay Marchand | 1 | |
| Total | 856 | 96 | Breton Sound | 36 | |
| South Louisiana: | | | Chandeleur Sound | 14 | |
| Acadia | 278 | 12 | East Cameron | 95 | 12 |
| Allen | 123 | 5 | Eugene Island [3] | 140 | 17 |
| Ascension | 27 | | Grand Isle | 18 | 9 |
| Assumption | 159 | | Main Pass | 54 | |
| Avoyelles | 19 | | Ship Shoal | 95 | 14 |
| Beauregard | 170 | 7 | South Marsh Island | 70 | 11 |
| Calcasieu | 198 | | South Pass | 17 | |
| Cameron | 182 | 24 | South Pelto | 4 | |
| East Baton Rouge | 30 | | South Timbalier | 93 | 28 |
| Evangeline | 114 | | Vermilion | 117 | 38 |
| Iberia | 210 | 90 | West Cameron | 145 | 118 |
| Iberville | 131 | 3 | West Delta | 19 | 12 |
| Jefferson | 151 | 3 | Total | 918 | 259 |

[1] National Oil Scouts and Landmen's Association, Oil- and Gas-Field Development in United States and Canada, Austin, Tex., vol. 27, 1957, pp. 382, 403, 432, 450.
[2] Plus 4 crew weeks with seismograph method.
[3] Plus 3 crew weeks with refraction seismograph method.

Digitized by Google

Seventy-nine new oil and gas fields were discovered from oil exploratory activity. The exploratory wells drilled during the year included 141 oil wells, 146 gas wells, and 674 dry holes.

**Carbon Black.**—Daily plant carbon-black capacity increased 72,000 pounds to a total of 1.6 million pounds per day. During the year 8 furnace-black plants and 1 contact-type plant were operating. Production rose 7 percent. Virtually all of the carbon black manufactured in the State was produced by the furnace-black process, which utilized natural gas and liquid hydrocarbons as raw materials. Of the total carbon black, about half was produced from natural gas and half from liquid hydrocarbons. In 1956, 565,000 pounds of contact black was produced with an average value of 2.11 cents per pound; 537 million pounds of furnace black was produced with an average value of 5.84 cents per pound. In the production of carbon black, 29 billion cubic feet of natural gas and 74 million gallons of liquid hydrocarbons were consumed. The average yield was 8.52 pounds of carbon black per thousand cubic feet of natural gas and 3.98 pounds per gallon of liquid hydrocarbons. The following table shows production for the period, 1952–56:

| Year: | *Production, million pounds* |
|---|---|
| 1952 | 256 |
| 1953 | 377 |
| 1954 | 368 |
| 1955 | 503 |
| 1956 | 538 |

**Natural Gas.**—The offshore area began to manifest itself as a large, undeveloped natural-gas source. In 1956 the lack of pipelines to shore still was hindering offshore production. Gas-discovery wells were capped until pipelines could be constructed. During 1954–56, 48 exploratory gas wells were successfully completed offshore.

In 1956 the quantities of natural gas originating in Louisiana, supplying many of the Nation's industrial and urban areas, continued upward. Compared with 1955, production was 12 percent greater. In 1947–56 recovery more than trebled. In 1952–56 production increased 50 percent, double the rate of increase for the Nation.

Louisiana was one of the leading natural-gas-consuming States because many industries were attracted there by the cheap, abundant supply of this quality fuel. The capacity to negotiate favorable long-term contracts for purchase of the fuel should continue to be an incentive for the continued high rate of local consumption.

**TABLE 11.—Marketed production of Natural gas, 1947–51 (average) and 1952–56 [1]**

| Year | Million cubic feet | Value at wells (thousand dollars) | Cents per thousand cubic feet | Year | Million cubic feet | Value at wells (thousand dollars) | Cents per thousand cubic feet |
|---|---|---|---|---|---|---|---|
| 1947–51 (average) | 777,255 | 36,991 | 4.8 | 1954 | 1,399,222 | 124,531 | 8.9 |
| 1952 | 1,237,143 | 82,889 | 6.7 | 1955 | 1,680,032 | 189,844 | 11.3 |
| 1953 | 1,293,644 | 106,079 | 8.2 | 1956 | 1,886,302 | 215,038 | 11.4 |

[1] Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

Digitized by Google

**Offshore Developments.**—At the end of 1956 an estimated $1.5 billion had been invested offshore by all oil operators. The cost of finding and developing 1 barrel of oil was estimated to be $14. Accumulated production income was estimated to be less than $250 million. Nearly 5 million acres of underwater lands had been leased and about 11 million feet of wells drilled. Approximately 87 percent of all offshore wells up through 1956 has been drilled in Louisiana.[6]

To some extent the extensive drilling program was to validate leases before their expiration dates. Also the supply of specialized offshore rigs improved, and over 100 mobile platforms, self-contained platforms and drilling tenders were operated offshore. A preference for mobile platforms for exploratory drilling developed. Self-contained platforms were expected to become more desirable for development drilling.[7] Water depth was an important consideration in selecting rigs.

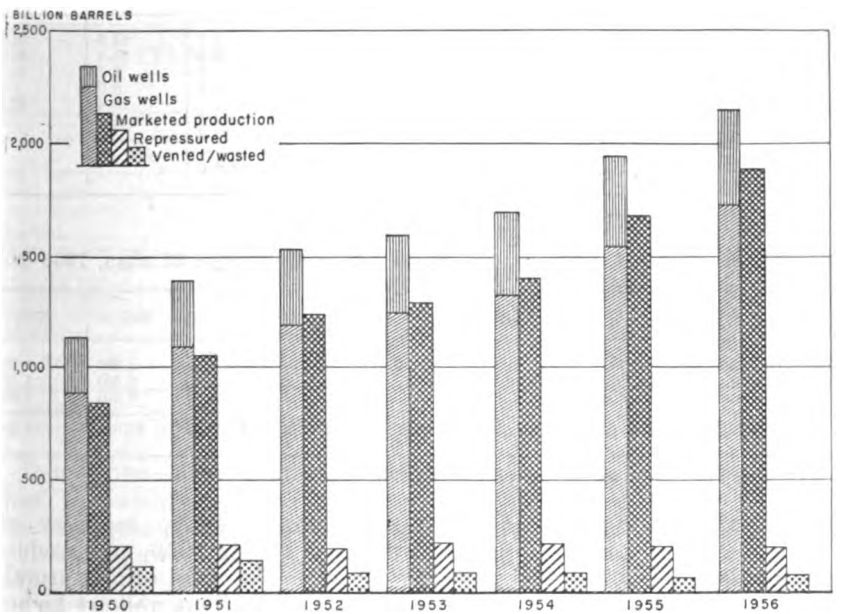



FIGURE 3.—Gross withdrawals and disposition of natural gas in Louisiana, 1950–56.

Among the operating problems were transportation of personnel and supplies to the rigs and costly servicing. The need for sizable production allowables to compensate for heavy investments created a financial problem.

Cumulative production in the offshore areas reached nearly 112 million barrels of crude petroleum and 431 billion cubic feet of natural gas by the end of 1956. For the year, 41 million barrels of oil and 137 billion cubic feet of natural gas were recovered.

[6] Petroleum Week, vol. 4, No. 8, Feb. 22, 1957, pp. 42-70 (special report on offshore activity).
[7] Work cited in footnote 6.



Digitized by Google

Offshore drilling, which had been halted several months during 1956 by court order, was resumed after an interim agreement was reached between the State of Louisiana and the Federal Government. The dispute involved the ownership of the rich tidelands in the Gulf of Mexico. Until a final decision by the Supreme Court, Louisiana is to control lands to 3½ miles out from its coast; the United States, lands over 30 miles from the coast. Both Louisiana and the Federal Government would approve permits for drilling in the area between 3½ and 30 miles from the coast. Royalties from drilling on existing leases would be held, pending the Court's decision.

**TABLE 12.—Consumption of natural gas, 1956, by uses**

| Use | Volume (million cubic feet) | Percent of total consumption | Average Louisiana value [1] | Average United States value [1] |
|---|---|---|---|---|
| Residential | 39,634 | 4.7 | 64.5 | 91.3 |
| Commercial | 16,320 | 2.0 | 45.4 | 64.9 |
| Field (drilling, pumping, etc.) | 166,349 | 19.8 | 9.5 | 10.5 |
| Carbon black | 28,706 | 3.4 | 8.0 | 7.9 |
| All other industrial (including electric utility plants) | 588,384 | | 15.4 | 25.3 |
| Refinery fuel | 104,915 | 12.5 | | |
| All other | 483,469 | 57.6 | | |
| Total | 839,393 | 100.0 | | |

[1] Cents per thousand cubic feet at point of consumption.

**TABLE 13.—Miles of utility gas mains for Louisiana by type of main, 1955–56**

| Type | 1955 | 1956 |
|---|---|---|
| Field and gathering | 1,960 | 2,030 |
| Transmission | 8,850 | 9,740 |
| Distribution | 7,010 | 7,580 |
| Total | 17,820 | 19,350 |

[1] American Gas Association, Gas Facts: 1956, p. 59; 1957, p. 60.

**Natural-Gas Liquids.**—Following national trends, recovery of natural gasoline and cycle products declined during 1956, and production of liquefied petroleum gases increased. The total of all natural-gas liquids recovered in 24 parishes was 5.7 million gallons higher than in 1955. Because of a sharp increase in stocks during the year, the price of natural gasoline was depressed. Continued strong demand strengthened the market position of liquefied petroleum gases.

A $3 million natural-gasoline plant with a daily gas capacity of 20 million cubic feet was dedicated by Gulf Natural Gas Corp. near Oil City. Casinghead gas for processing was to be delivered from 1,700 wells in the Pine Island field in Caddo Parish.

Jefferson Lake Sulphur Co. completed a test run on its new Rotosorber process for separating liquid hydrocarbons from natural gas at its plant in St. Mary Parish. The plant had a daily rated capacity to process 40 million cubic feet of gas, with an expected daily yield of 5,000 gallons of natural gasoline and 5,000 gallons of butane and propane. Sunray Mid-Continent Oil Corp. placed its new cycling

Digitized by Google

plant on stream during the year at Northwest Branch, La. Plant capacity was 690 million cubic feet of natural gas a month, with expected production of 65,000 barrels of natural-gas liquids.

**TABLE 14.—Natural-gas liquids produced, 1947–51 (average) and 1952–56**

| Year | Natural gasoline and cycle products | | LP-gases | | Total | |
|---|---|---|---|---|---|---|
| | Thousand gallons | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) |
| 1947–51 (average) | 573,005 | 42,468 | 219,768 | 10,275 | 792,773 | 52,743 |
| 1952 | 672,042 | 48,579 | 297,444 | 14,890 | 969,486 | 63,469 |
| 1953 | 665,532 | 55,421 | 287,280 | 12,654 | 952,812 | 68,075 |
| 1954 | 665,070 | 54,330 | 292,226 | 11,620 | 957,296 | 65,950 |
| 1955 | 782,328 | 59,158 | 291,138 | 10,323 | 1,073,466 | 69,481 |
| 1956 | 773,949 | 62,394 | 305,222 | 14,727 | 1,079,171 | 77,121 |

**TABLE 15.—Sales of LP-gases, 1955–56, by uses**

(Thousand gallons)

| Use | Butane | | Propane | | Mixture | | Total | |
|---|---|---|---|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 | 1955 | 1956 | 1955 | 1956 |
| Domestic | 3,964 | 7,886 | 17,504 | 20,332 | 52,145 | 47,879 | 73,613 | 76,097 |
| Gas manufacturing | | | | | 110 | | 110 | |
| Industrial | 500 | 3,830 | 5,336 | 8,897 | 5,059 | 3,787 | 10,895 | 16,514 |
| Synthetic rubber | 12,677 | 22,037 | | | [1] 14,233 | [1] 14,314 | 26,910 | 36,351 |
| Chemical plants | 10,715 | 5,137 | 45,034 | 1,919 | 131,434 | 177,018 | 188,083 | 184,074 |
| Internal combustion | 513 | 2,128 | 5,682 | 6,396 | 20,313 | 18,337 | 26,508 | 26,861 |
| All other | | | 5 | 9 | 69 | 192 | 74 | 201 |
| Total | 28,369 | 41,018 | 74,461 | 37,553 | 223,363 | 261,527 | 326,193 | [2] 340,098 |

[1] Isobutane.
[2] Consumption of LP-gases as refinery fuel not included.

**Petroleum.**—Curtailment of crude-oil shipments from the Middle East, following closing of the Suez Canal, made it necessary for United States producers to increase exports to supply European and other consuming areas. In addition, a sizable increase in domestic demand added to the total requirements. Runs to refineries set new records. As a consequence, Louisiana production was the highest in history. The Louisiana Department of Conservation increased monthly allowables by the end of the year to over 29 million barrels. The 299-million-barrel recovery from 56 parishes was a record. By the end of 1956 offshore recovery was becoming substantial. According to the Louisiana Department of Conservation, about 13.5 percent of the State's total crude-oil production in 1956 was from the tidelands.

Richardson & Bass et al. set a new producing depth record at the wells drilled the previous year in Plaquemines Parish. The well, 1–L, Humble—L. L. & E., flowed 206 barrels of oil a day from the Miocene sands at depths of 21,443–21,465 and 21,419–21,435 feet, making it the deepest producer in the world.[8]

[8] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 147.

Digitized by Google

**TABLE 16.—Production of crude petroleum, 1947–51 (average) and 1952–56**

| Year | Thousand barrels | Value | | Year | Thousand barrels | Value | |
|---|---|---|---|---|---|---|---|
| | | Total (thousand dollars) | Average per barrel | | | Total (thousand dollars) | Average per barrel |
| 1947–51 (average) | 194,732 | 496,802 | $2.55 | 1954 | 246,558 | 722,370 | $2.93 |
| 1952 | 243,929 | 645,090 | 2.64 | 1955 | 271,010 | 793,280 | 2.93 |
| 1953 | 256,632 | 721,150 | 2.81 | 1956 | 299,421 | 877,951 | 2.93 |

**TABLE 17.—Indicated demand, production, and stocks of crude petroleum by months, 1955–56**

(Thousand barrels)

| Month | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Indicated demand | Production | Stocks [1] | Indicated demand | Production | Stocks [1] |
| January | 21,534 | 21,909 | 15,444 | 24,819 | 24,636 | 16,290 |
| February | 20,923 | 20,182 | 14,703 | 23,684 | 23,346 | 15,952 |
| March | 21,469 | 22,626 | 15,860 | 25,426 | 25,463 | 15,989 |
| April | 21,908 | 22,169 | 16,121 | 23,677 | 24,842 | 16,993 |
| May | 22,126 | 23,121 | 17,116 | 26,049 | 24,757 | 15,595 |
| June | 22,935 | 21,267 | 15,448 | 24,496 | 24,044 | 15,223 |
| July | 21,840 | 22,474 | 16,082 | 23,122 | 24,297 | 16,282 |
| August | 23,791 | 22,792 | 15,083 | 23,780 | 24,619 | 16,898 |
| September | 21,425 | 22,677 | 16,335 | 23,684 | 23,563 | 16,981 |
| October | 24,172 | 23,651 | 15,814 | 24,102 | 24,667 | 17,164 |
| November | 23,018 | 23,516 | 16,312 | 24,737 | 25,543 | 17,533 |
| December | 24,472 | 24,626 | 16,466 | 28,162 | 29,644 | 18,697 |
| Total | 269,613 | 271,010 | ---------- | 295,718 | 299,421 | ---------- |

[1] End-of-month figures.

**TABLE 18.—Number of producing oil wells and average production per well, 1947–56**

| Year | Number of producing wells, as of Dec. 31 | Average production per well per day (barrels) | Year | Number of producing wells, as of Dec. 31 | Average production per well per day (barrels) |
|---|---|---|---|---|---|
| 1947 | 8,700 | 52.4 | 1952 | 13,290 | 51.7 |
| 1948 | 9,770 | 53.7 | 1953 | 14,220 | 49.4 |
| 1949 | 10,890 | 50.6 | 1954 | 15,980 | 44.6 |
| 1950 | 11,860 | 50.4 | 1955 | 18,800 | 42.7 |
| 1951 | 12,490 | 52.3 | 1956 | 20,905 | 41.0 |

Digitized by Google

**TABLE 19.—Production of crude petroleum, 1952–56, by districts and fields**

(Thousand barrels)

| District and field | 1952 | 1953 | 1954 | 1955 | 1956 [1] |
|---|---|---|---|---|---|
| Gulf Coast: | | | | | |
| Anse la Butte | 2,373 | 2,165 | 1,699 | 1,719 | 1,890 |
| Avery Island | 3,090 | 3,111 | 2,724 | 3,499 | 3,303 |
| Bateman Lake | | | | | 1,718 |
| Barataria | 2,876 | 2,351 | 1,628 | 1,358 | 1,103 |
| Bay de Chene | 1,288 | 1,302 | 1,208 | 1,456 | 1,609 |
| Bay Marchand | 2,004 | 1,560 | 2,430 | 2,933 | 3,539 |
| Bay St. Elaine | 2,733 | 3,194 | 3,130 | 3,315 | 3,188 |
| Bayou Blue | 1,156 | 1,158 | 1,060 | 955 | 931 |
| Bayou Choctaw | 600 | 893 | 1,171 | 1,293 | 1,176 |
| Bayou Mallett | 1,604 | 1,796 | 1,413 | 1,140 | 1,043 |
| Bayou Sale | 5,199 | 4,710 | 3,589 | 3,090 | 2,825 |
| Bully Camp | 1,250 | 1,640 | 1,353 | 1,767 | 1,623 |
| Caillou Island | 7,136 | 8,540 | 8,398 | 9,017 | 9,626 |
| Charenton | 1,176 | 1,278 | 1,223 | 1,234 | 1,426 |
| Cox Bay | 2,102 | 2,700 | 3,413 | 3,113 | 2,762 |
| Delta Farms | 6,751 | 6,480 | 5,456 | 4,810 | 4,493 |
| Dog Lake | 1,276 | 1,530 | 1,270 | 1,072 | 947 |
| Duck Lake | 2,269 | 2,935 | 3,199 | 3,329 | 2,916 |
| East White Lake | 1,427 | 1,479 | 1,179 | 1,390 | 1,390 |
| Egan | 2,041 | 2,017 | 2,117 | 2,225 | 2,529 |
| Erath | 1,179 | 1,370 | 1,152 | 964 | 919 |
| Garden Island Bay | 1,590 | 1,590 | 1,410 | 1,343 | 1,340 |
| Gibson | 1,498 | 1,410 | 1,140 | 1,020 | 919 |
| Golden Meadows | 4,546 | 3,918 | 3,974 | 3,784 | 3,452 |
| Good Hope | 2,288 | 2,045 | 1,446 | 1,208 | 1,087 |
| Grand Bay | 3,638 | 3,768 | 3,519 | 3,403 | 4,030 |
| Gueydan | 1,970 | 1,570 | 1,298 | 1,076 | 963 |
| Hackberry | 3,780 | 4,512 | 4,215 | 4,451 | 5,927 |
| Horseshoe Bayou | 1,303 | 1,394 | 1,097 | 871 | 836 |
| Iberia | | | | | 800 |
| Iowa | 2,513 | 2,842 | 2,701 | 2,465 | 2,214 |
| Jeanerette | 1,084 | 1,137 | 1,228 | 1,193 | 1,148 |
| Jennings | | | | | 1,024 |
| Lafitte | 4,467 | 4,650 | 3,686 | 3,323 | 2,935 |
| Lake Arthur South | | | | | 1,097 |
| Lake Barre | 417 | 599 | 1,056 | 1,363 | 1,723 |
| Lake Chicot | 1,104 | 1,072 | 1,021 | 1,031 | 1,009 |
| Lake Fausse Point | 468 | 576 | 823 | 1,344 | 1,499 |
| Lake Pelto | 2,456 | 2,697 | 2,324 | 2,421 | 2,652 |
| Lake Salvador | 1,843 | 1,831 | 1,415 | 1,370 | 1,391 |
| Lake Washington | 380 | 951 | 1,947 | 4,697 | 7,849 |
| La Rose | | | | | 1,095 |
| Leeville | 2,417 | 3,251 | 3,556 | 4,088 | 4,094 |
| Little Lake | 192 | 823 | 1,582 | 2,147 | 2,353 |
| Lockport | | | | | 908 |
| Main Pass Block 69 | 2,445 | 4,287 | 4,981 | 6,354 | 8,417 |
| North Crowley | 1,390 | 1,504 | 1,273 | 1,299 | 1,168 |
| Paradis | 3,411 | 3,445 | 3,379 | 3,172 | 2,843 |
| Phoenix Lake | 1,507 | 1,781 | 1,778 | 1,533 | 1,367 |
| Pine Prairie | 984 | 955 | 864 | 885 | 927 |
| Point-a-La Hache | 2,746 | 2,689 | 2,451 | 2,168 | 1,999 |
| Port Barre | 1,285 | 1,327 | 1,056 | 925 | 852 |
| Quarantine Bay | 3,480 | 3,151 | 2,649 | 3,151 | 3,964 |
| Romere Pass | 3,641 | 4,570 | 4,719 | 3,913 | 3,485 |
| St. Gabriel | 2,095 | 1,778 | 1,278 | 1,047 | 825 |
| Section 28 | 1,343 | 1,244 | 1,335 | 1,359 | 1,396 |
| Shuteston | | | | | 1,025 |
| South Pass Block 24 | | | | | 8,208 |
| Tepetate | 2,647 | 2,149 | 1,722 | 1,692 | 1,706 |
| Timbalier Bay | 1,731 | 2,514 | 2,289 | 3,935 | 6,120 |
| University | 1,811 | 1,534 | 1,391 | 1,073 | 934 |
| Valentine | 902 | 1,252 | 1,379 | 1,684 | 1,802 |
| Venice | 5,965 | 5,728 | 5,364 | 4,903 | 5,117 |
| Ville Platte | 1,424 | 1,333 | 1,402 | 1,249 | 1,150 |
| Vinton | 3,786 | 3,618 | 2,712 | 2,352 | 2,203 |
| Weeks Island | 10,680 | 11,258 | 9,029 | 8,210 | 8,668 |
| West Bay | 3,123 | 3,132 | 2,525 | 2,423 | 3,326 |
| West Cote Blanche Bay | 2,830 | 2,865 | 2,380 | 2,016 | 1,891 |
| West Lake Verrett | 1,966 | 1,757 | 1,517 | 1,332 | 1,361 |
| White Castle | 1,563 | 1,343 | 941 | 763 | 786 |
| Other Gulf Coast [2] | 49,780 | 56,071 | 58,048 | 77,694 | 76,607 |
| Total Gulf Coast | 200,019 | 214,130 | 204,721 | 227,409 | 251,448 |

See footnotes at end of table.

Digitized by Google

**TABLE 19.—Production of crude petroleum 1952–56, by districts and fields—Con.**

(Thousand barrels)

| District and field | 1952 | 1953 | 1954 | 1955 | 1956 [1] |
|---|---|---|---|---|---|
| Northern: | | | | | |
| Big Creek | 1,432 | 1,279 | 900 | 750 | 679 |
| Caddo | 5,111 | 5,438 | 8,251 | 9,111 | 8,417 |
| Cotton Valley | | | | | 1,407 |
| Delhi | 6,436 | 5,916 | 4,880 | 5,377 | 6,301 |
| Esperance Point | | | | | 1,664 |
| Haynesville | 5,008 | 4,445 | 3,694 | 3,234 | 2,859 |
| Lake St. John | 4,870 | 4,015 | 3,162 | 2,788 | 2,430 |
| Nebo [2] | 2,272 | 2,268 | 2,270 | 2,193 | 1,905 |
| Olla [4] | 2,203 | 2,106 | 1,934 | 1,709 | 1,626 |
| Rodessa | 934 | 868 | 784 | 793 | 751 |
| Sligo | 859 | 879 | 966 | 1,030 | 1,043 |
| Urania | | | | | 786 |
| Other Northern [3] | 14,785 | 15,288 | 14,996 | 16,616 | 16,613 |
| Total Northern | 43,910 | 42,502 | 41,837 | 43,601 | 46,501 |
| Total Louisiana | 243,929 | 256,632 | 246,558 | 271,010 | 297,949 |

[1] Preliminary figures.
[2] Includes crude oil consumed on leases and net change in stocks held on leases for entire district.
[3] Includes Hemphill, Trout Creek, and Jena.
[4] Includes Little Creek and Summerville.

**Refineries.**—Crude-oil capacity of Louisiana refineries at the end of the year was 730,650 barrels per day. Cracked-gasoline capacity was 202,910 barrels per day. The expansion and modernization of Louisiana refineries continued. As a part of a multi-million-dollar expansion program at its Meraux refinery, Ingram Products Co. placed a 3,000-barrel platformer on stream for production of high-octane gasoline. Bay Petroleum Corp. completed installing a 5,000, barrel-per-day platformer unit and made additions and alterations to its New Orleans refinery's crude and catalytic cracking units. Construction began on a $6,250,000 coking unit by Continental Oil Co. adjacent to its Lake Charles refinery. The plant was designed to produce 85,000 tons of coke annually.

**TABLE 20.—Production at Louisiana Gulf Coast refineries, 1956**

| Product | Thousand barrels | Product | Thousand barrels |
|---|---|---|---|
| Gasoline | 128,253 | Coke | 2,863 |
| Kerosine | 20,081 | Asphalt | 5,316 |
| Distillate fuel oil | 66,197 | Road oil | 1 |
| Residual fuel oil | 19,089 | Still gas | 9,105 |
| Jet fuel | 6,867 | Liquefied gases | 11,509 |
| Lubricants | 6,295 | Miscellaneous | 1,600 |
| Wax | 672 | | |

Digitized by Google

**TABLE 21.—Capacity of petroleum refineries and cracking plants at end of 1956**

(Barrels per day)

| Company | Location | Crude-oil capacity, operating | Cracked-gasoline capacity, operating |
|---|---|---|---|
| Inland: | | | |
| Bayou State Oil Corp. | Hosston | 1,000 | |
| Calumet Refining Co. | Princeton | 950 | |
| Cotton Valley Solvents, Inc. | Cotton Valley | 5,000 | |
| Great National Refining Corp. | Ida | 800 | |
| Gulf: | | | |
| American Oil Co. | Destrehan | 35,500 | 9,000 |
| Bay Petroleum Corp. | Chalmette | 22,000 | 8,500 |
| Breaux Bridge Oil Refining Co. | Anse La Butte | (1) | (2) |
| Canal Refining Co. | Church Point | [3] 900 | 700 |
| Cities Service Refining Corp. | Lake Charles | 185,000 | 54,400 |
| Clark Oil & Refining Corp. | Marrero | 7,500 | 975 |
| Continental Oil Co. | West Lake (Lake Chas.) | 52,000 | 16,085 |
| Esso Standard Oil Co. | Baton Rouge | [4] 308,000 | [5] 81,700 |
| Evangeline Refining Co., Inc. | Jennings | 2,000 | |
| Ingram Products Co. | Meraux | 15,000 | 5,550 |
| Shell Oil Co. | Norco | 95,000 | 26,000 |
| Total | | 730,650 | 202,910 |

[1] In addition 1,000 barrels per day, shut down.
[2] In addition 780 barrels per day, shut down.
[3] In addition 200 barrels per day, building.
[4] In addition 2,000 barrels per day, shut down.
[5] In addition 1,700 barrels per day, shut down.

**TABLE 22.—Sales of petroleum products, 1952–56**

(Thousand barrels)

| Product | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Gasoline [1] | 15,510 | 16,742 | 17,572 | 19,961 | 20,872 |
| Kerosine | 1,572 | 1,425 | 1,348 | 1,228 | 1,207 |
| Range oil | 764 | 664 | 675 | 648 | 742 |
| Distillate fuel oil | 5,840 | 6,212 | 6,242 | 7,385 | 7,653 |
| Residual fuel oil | 10,422 | 9,929 | 9,710 | 10,601 | 10,804 |

[1] Gasoline consumption from American Petroleum Institute.

**TABLE 23.—Sales of distillate and residual fuel oils, 1955–56, by uses**

(Thousand barrels)

| Use | Distillate fuels | | Residual fuels | |
|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 |
| To railroads | 1,223,000 | 1,270,000 | 57,000 | 11,000 |
| To vessels (including tankers) | 2,088,000 | 2,181,000 | 8,592,000 | 8,834,000 |
| To gas and electric power plants | 63,000 | 54,000 | 32,000 | 23,000 |
| Industrial (excluding oil company use) | 656,000 | 640,000 | 647,000 | 671,000 |
| Oil-company fuel | 195,000 | 240,000 | 470,000 | 391,000 |
| Light heating oils | 659,000 | 689,000 | | |
| Heavy heating oils | | | 571,000 | 625,000 |
| To military | 465,000 | 494,000 | 140,000 | 142,000 |
| Miscellaneous uses | 1,959,000 | 1,986,000 | 92,000 | 107,000 |
| Range oil No. 1 | 77,000 | 99,000 | | |
| Total | 7,385,000 | 7,653,000 | 10,601,000 | 10,804,000 |

Digitized by Google

**Petrochemicals.**—The industrial picture in Louisiana during 1956 was dominated by the unabated growth of the chemical industry. The Gulf Coast region of Texas and Louisana was rapidly becoming one of the most important chemical-producing areas in the world and was the source of an estimated four-fifths of all petrochemicals being produced in the Nation. Because of abundant raw-material supplies, Louisana was expected to hold a leading position in the future growth of the industry.

Several petrochemical complexes had begun to appear in the State; these were groups attracted together by supplies of natural gas and refinery-waste gases. The evolving cluster at Lake Charles, where Cities Service Refining Corp. and Continental Oil Co. refineries supplied raw materials was illustrative of the trend. Butadiene made from refinery gases by Petroleum Chemical, Inc., was being used at the adjacent Firestone Tire & Rubber Co. plant for manufacturing synthetic rubber. Expansion programs at both plants raised butadiene capacity 15,000 tons and synthetic rubber by 40,000 tons. Petroleum Chemical, Inc. (owned jointly by Cities Service Refining Corp. and Continental Oil Co.) began constructing two new plants for further use of refinery gases. Hydrogen developed by the refinery re-forming units would be used at 1 plant for manufacturing 100,000 tons of anhydrous ammonia a year. At another plant ethylene would be produced from refinery gases for conversion to ethylene glycol and other chemical products.

Most chemical activity was centered along the Mississippi River from Baton Rouge to New Orleans. Attracted by abundant supplies of ethylene from the huge refinery of Esso Standard Oil Co. at Baton Rouge, Wyandotte Chemicals Corp. began constructing an $8-million ethylene oxide plant with an annual capacity of 60,000 pounds a year for production of ethylene glycol. W. R. Grace broke ground for a plant to use Esso ethylene for low-pressure production of polyethylene, which will be used in a variety of plastic products.

Monsanto Chemical Co. started to build an adipic acid plant at the Barton ammonia plant at Luling. Ethyl Corp. announced plans for a plant at Baton Rouge for producing vinyl chloride monomer to be used in the manufacture of plastics. Operations were begun at American Cyanamid Co.'s new monomethyl styrene plant at its facilities near Avondale. A series of further expansions was anticipated for this petrochemical operation. At Norco, Shell Chemical Co. planned a 40-million-pound-a-year methyl-ethyl ketone plant.

Synthetic sodium nitrate continued to be produced at Lake Charles by Olin-Mathieson Chemical Corp. This plant was 1 of only 2 such plants in the country. In addition to the anhydrous ammonia plant under construction at Lake Charles, there were similar plants at Avondale, Sterlington, and Luling, as well as the existing plant at Lake Charles.

## NONMETALS

The nonmetals produced in Louisana are classified into two types—chemical and construction materials. The chemical materials (sulfur, lime, and salt) follow the trends in the chemical and chemical-using industries. The volume of construction materials (clays, gypsum,

Digitized by Google

cement, sand and gravel, stone, and shell) depends on residential, commercial, and industrial construction.

In the 10-year period 1947–56 the trends in value of new construction and value of mineral construction materials produced in the State paralleled each other, both nearly tripling. In 1956 the total value of construction minerals in Louisana was approximately $34 million. Highway construction used large quantities of cement, sand and gravel, stone, and shell. The overall effect was an increase in raw material requirements for highways. Although maintenance expenditures remained about the same as in 1955, highway-construction expenditures for contracted work increased 47 percent to a total of over $71 million.

Because of the stimulus of new construction in the State in 1956, production of construction materials was one-sixth greater than in 1955. High activity in industrial building, particularly in the Baton Rouge-New Orleans area, were expected to maintain a strong market demand for construction materials.

Expenditures for industrial, commercial, and public works were the largest part of total construction in 1956. Tonnagewise, this type of construction consumes the greatest quantity of the bulk mineral construction materials. Total contracts awarded for construction in 1956 were 2.4 percent greater than in 1955. This increase would have been much more pronounced, had it not been for a rather sharp decline in contracts for residential construction. Figures for construction awards by types follow:[9]

| Type | Value of construction contracts awarded | | Change, percent |
|---|---|---|---|
| | 1955 | 1956 | |
| Residential | $191,682,000 | $167,653,000 | −12.5 |
| Nonresidential | 181,769,000 | 206,844,000 | 13.8 |
| Public works and utilities | 238,724,000 | 252,176,000 | 5.6 |
| Total | 612,175,000 | 626,673,000 | 2.4 |

National trends for the consumption of chemical raw materials in 1956 generally continued upward in both the inorganic and organic chemical industries. Of the inorganic raw materials, salt and sulfur were in the greatest demand in the State. Louisiana sulfur shipments, although greater than in 1955, were limited because consumption of sulfuric acid remained virtually unchanged in the 2 years, and Mexican sulfur began competing.

Two new electrolytic caustic-chlorine plants were established in Louisiana to use salt as a raw material. The caustic soda was expected to be used mainly by the growing alumina industry of the State. In recent years the electrolytic process coproduct, chlorine, has grown in demand. A large user of chlorine is the pulp and paper industry. The rapid growth of the pulp and paper industry in the Midsouth, particularly in northern Louisiana, also represented a ready market for the gas as the plants were completed.

[9] Dodge Statistical Research Service in Louisana Business Review, vol. 21, No. 2, February 1957, p. 15.

Digitized by Google

A number of mineral-processing plants operating in Louisiana were supplying local markets and using raw materials imported from other States. These included 2 barite-grinding plants, 2 perlite-expanding plants, and 1 plant for exfoliating vermiculite.

**Barite.**—The vast drilling program of the petroleum industry in South Louisiana so augmented the demand for barite for drilling muds that Magnet Cove Barium Corp. constructed a new barite-grinding mill at Lake Charles. The mill used both domestic and imported ores in 1956. The same company had operated a grinding mill at New Orleans several years.

**Cement.**—Consumption of cement in Louisiana during 1956 followed the trend of the previous 2 years, increasing at double the rate of the Nation as a whole. Production at the State's two cement plants increased to help meet this demand. The addition of a fifth kiln and related mills, slurry tanks, etc., and increased storage capacity was completed by midyear at the Baton Rouge plant of Ideal's Cement Co. The plant, originally designed for sintering bauxite, would be economically more efficient after a few additional modifications were completed. Work continued on construction of a new cement plant on the Calcasieu River channel near Lake Charles by the Lone Star Cement Co. Proposed cement capacity of this plant was 2 million barrels a year, based on oyster-shell as raw material.

**TABLE 24.—Shipments of finished portland cement into Louisiana from mills, 1947–51 (average) and 1952–56**

| Year | Louisiana, thousand barrels | Change in Louisiana, percent | Change in United States, percent | Year | Louisiana, thousand barrels | Change in Louisiana, percent | Change in United States, percent |
|---|---|---|---|---|---|---|---|
| 1947–51 (average) | 4,155 | +15.7 | +7.7 | 1954 | 6,292 | +9.2 | +5.7 |
| 1952 | 5,869 | +11.1 | +4.3 | 1955 | 7,340 | +16.7 | +6.4 |
| 1953 | 5,759 | −1.9 | +4.1 | 1956 | 8,507 | +16.0 | +6.0 |

**Clays.**—The use of clays in Louisiana was divided equally between lightweight aggregate, structural clay products, and portland cement. During 1956 there were 12 brick plants in 11 parishes. The output of clay recovered strongly from the decline of the previous year to an all-time high of 785,000 tons. Production of clay for structural-clay products declined with residential construction, but a substantial increase of lightweight aggregate at plants at Erwinville and Alexandria caused the overall increase over 1955.

A modernization program at the Dixie Brick, Inc., plant at Natchitoches was expected to boost the daily capacity to 40,000 brick as compared with the existing output of 30,000 brick. The modernization program included installation of an electrically operated production-equipment system, replacing a gasoline-power system that had been in use for the past quarter century. The plant produced building brick.

**Gypsum.**—In April 1956 National Gypsum Co. began operating its new gypsum-products plant at Westwego on a 20-acre tract in Jefferson Parish 15 miles northeast of New Orleans. Gypsum was imported from Jamaica for manufacture of gypsum lathing, wallboard, base-coat plasters, and other construction products.

Digitized by Google

TABLE 25.—Miscellaneous clay sold or used by producers 1947–51 (average), and 1952–56 [1]

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 269,518 | $224,270 | 1954 | 713,940 | $940,940 |
| 1952 | 390,136 | 433,808 | 1955 | 651,268 | 659,099 |
| 1953 | 614,427 | 901,612 | 1956 | 785,283 | 785,283 |

[1] Excludes bentonite.

At Winnfield, Anderson & Dunham, Inc., mined crude gypsum for use as a cement retarder and for road construction and maintenance. The quantity produced declined 18 percent.

**Lime.**—Olin Mathieson Chemical Corp. produced lime from oystershell for use in industrial chemicals at its chemical plant at Lake Charles.

**Perlite.**—Lightweight plaster and concrete aggregate were manufactured at Bossier City and New Orleans from crude perlite shipped into the State.

**Salt.**—Recovery of salt in Louisiana in 1956 increased for the fifth consecutive year to 3.7 million tons—4 percent higher than 1955. The State ranked fourth in the Nation in recovery of salt. A larger output of rock salt largely accounted for the additional production. About three-fourths of Louisiana salt was used for manufacturing chlorine, soda ash, and other industrial chemicals. Of all salt produced, 70 percent was consumed in Louisiana for industrial and other purposes.

Sixty-two percent of the total salt was recovered from wells as liquid brines. These brines were used at Lake Charles by Olin Mathieson Chemical Corp. for manufacturing soda ash and Columbia-Southern Chemical Corp. for producing chlorine. At North Baton Rouge the Solvay Process Division of Allied Chemical & Dye Corp. made soda ash, chlorine, and other chemicals from brines from wells near Plaquemine. Most Louisiana rock salt was shipped to States in Southern and Southwestern United States.

Production was concentrated in the vicinity of Weeks, Avery, and Jefferson Island on the coastal waterway and at Winnfield in Winn Parish.

Wyandotte Chemicals Corp. decided to erect a large electrolytic chlorine-caustic soda plant at Geismar in Ascension Parish. Selection of the site was based on enormous supplies of salt from several nearby domes, abundant natural gas and electric power, and the Mississippi River as a natural means of access up and down the central region and to the sea. The plant was to be built adjacent to the new company ethylene oxide plant. Part of the caustic was committed to Olin Revere Metals Corp. alumina plant to be erected at Burnside.

At Gramercy Kaiser Aluminum & Chemical Corp. planned to construct a caustic-chlorine plant to supply caustic soda for its new alumina plant at that site. The plant was of the diaphragm-cells type, for electrolytic reduction of salt into soda ash and chlorine. The coproduct—chlorine—would be marketed.

Digitized by Google

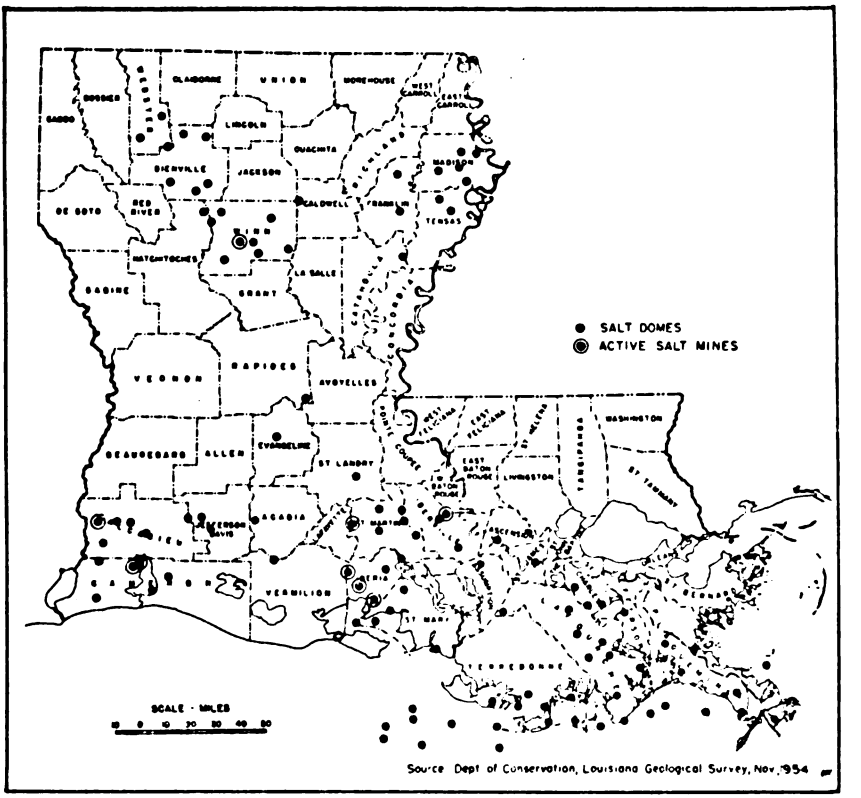



FIGURE 4.—Location of salt domes in Louisiana.

**TABLE 26.—Salt sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 2,244,933 | $6,549,195 | 1954 | 3,088,686 | $11,101,456 |
| 1952 | 2,553,448 | 7,807,693 | 1955 | 3,562,636 | 15,406,993 |
| 1953 | 3,061,234 | 9,189,526 | 1956 | 3,703,500 | 17,695,270 |

**TABLE 27.—Production of salt, 1955–56, by types**

| Type | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Evaporated salt | 110,218 | $1,743,445 | 121,900 | $1,995,188 |
| Rock salt | 1,198,299 | 7,602,698 | 1,293,784 | 8,515,502 |
| Brine | 2,254,119 | 6,060,850 | 2,287,816 | 7,184,580 |

Digitized by Google

With the probable influx of chemical industries into Louisiana, the economically situated salt domes will become more promising mineral resources. There were 110 known salt domes in Louisiana, as reported by the Department of Conservation of Louisiana, in November 1954.

**Sand and Gravel.**—The 15-percent increase in sand and gravel production during 1956 reflected the rapid growth of construction in the area. Of the more than 3 million tons of sand recovered, 38 percent was consumed in Louisiana as structural sand, 56 percent was used as paving sand, and the remaining 6 percent was used as molding, blast, and filter sand and for railroad ballast. Over 6 million tons of gravel was produced; 37 percent went into concrete, 60 percent was used as paving gravel, and the remaining 3 percent was employed for railroad ballast and other purposes. In all, there were 53 commercial sand and gravel operations in 23 parishes. Most of the sand and gravel production lies north of an east-west line across the State from Baton Rouge.

**TABLE 28.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Commercial | | Government-and-contractor | | Total | | |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| | | | | | | Total | Average per ton |
| 1947–51 (average) | 4,954,003 | $5,807,734 | 255,525 | $96,341 | 5,209,528 | $5,904,075 | $1.13 |
| 1952 | 5,788,098 | 6,660,994 | 217,021 | 75,530 | 6,005,119 | 6,736,524 | 1.12 |
| 1953 | 4,305,597 | 5,090,598 | 232,790 | 71,650 | 4,538,387 | 5,162,248 | 1.14 |
| 1954 | 7,641,229 | 9,592,566 | 268,923 | 94,069 | 7,910,152 | 9,686,635 | 1.22 |
| 1955 | 8,338,015 | 10,758,658 | 236,005 | 183,202 | 8,574,020 | 10,941,860 | 1.28 |
| 1956 | 9,578,520 | 12,073,156 | 253,923 | 85,272 | 9,832,443 | 12,158,428 | 1.24 |

**Stone.**—The relative scarcity of good-quality or economically located stone has forced Louisiana to rely on abundant supplies of clam- and oyster-shell from lakebeds and coastal reefs. More than half of all shell produced in 1956 was clamshell. Oystershell was considered preferable to clamshell for many chemical uses and for making cement because of its grinding characteristics. Basically, clamshell was used for aggregate and paving. It also was used for neutralizing industrial waste solutions. Over one-fourth of all shell produced was used in Louisiana for manufacturing cement and lime. Large quantities of shell also were used for concrete aggregate and road material.

At New Orleans artificially colored roofing granules were produced by the Flintkote Co.

**Sulfur.**—Notable events in the Louisiana sulfur industry in 1956 included preliminary development of Freeport Sulphur Co. Lake Pelto deposit and the announcement of plans by Freeport to operate the newly discovered Grand Isle deposit. The Lake Pelto property lies in shallow waters in the tideland, 60 miles southwest of New Orleans. Grand Isle, discovered by Humble Oil Co. during exploratory drilling for oil, was considered one of the largest sulfur discoveries

Digitized by Google

of recent years. Located in 45 feet of water 6 miles from the nearest land, the deposit would be the first completely offshore sulfur operation in history. Freeport Sulphur Co. entered into an agreement to operate the property under a profit-sharing plan with Humble. Other mines recovering sulfur during the year were Grand Ecaille, Bay Ste. Elaine, Garden Island Bay, Chacahoula, and Starks Dome.

Consumption and production of sulfur reached new highs. Recovery of Frasch sulfur in Louisiana was 17 percent greater than in 1955. The increased shipments of sulfur from Louisiana, although not as large as the increased production, were good in view of a decline in Texas shipments and in the face of new Mexican competition.

Freeport Sulphur Co. installed new docking facilities at Port Sulphur. At this port liquid sulfur from Grand Ecaille, Bay Ste. Elaine, and Garden Island Bay was either to be solidified in storage bins or kept liquid in heated tanks. At the shipping point a new loading machine enabled the operator to load a ship or barge in half the time normally required. Facilities were installed in 1955 for loading molten sulfur to meet the increasing demand for liquid sulfur.

**TABLE 29.—Sulfur produced and shipped from Frasch mines, 1947–51 (average) and 1952–56**

| Year | Production (long tons) | Shipments | | |
|---|---|---|---|---|
| | | Long tons | Value | |
| | | | Total | Average per ton |
| 1947–51 (average) | 1,114,033 | 1,077,590 | $20,374,000 | $18 91 |
| 1952 | 1,508,550 | 1,449,668 | 32,015,000 | 22 08 |
| 1953 | 1,640,571 | 1,609,364 | 43,453,000 | 27. 00 |
| 1954 | 2,009,553 | 1,853,563 | 49,222,394 | 26. 56 |
| 1955 | 2,081,261 | 2,072,418 | 58,027,704 | 28. 00 |
| 1956 | 2,429,490 | 2,238,852 | 59,329,579 | 26. 50 |

**Vermiculite.**—Zonolite Co. exfoliated vermiculite in New Orleans from crude material shipped to Louisiana from other States. This mineral was used as a lightweight construction material.

**Water.**—Louisiana ranked 10th in the Nation in the use of industrial waters. Industrial water use rose from 1,940 million gallons daily in 1950 to 3,750 million in 1955. Forty percent of the industrial water was used for the generation of power. New Orleans used 1,370 million gallons daily; Baton Rouge 813 million gallons daily; and Lake Charles 567 million gallons daily. One industrial plant in New Orleans used five times as much water as was delivered by the New Orleans' municipal water-supply system. The aluminum, oil-refining, and chemical industries were responsible for the large consumption of water in the State, and further increases in water consumption were expected as industry growth occurs. The State, however, is blessed with an abundant supply of suitable waters for industrial use. At Baton Rouge, for example, the average flow of the Mississippi River is 312 billion gallons daily. Louisiana also has abundant supplies of under-

Digitized by Google

ground water. The following table shows the major consumption of industrial water in 1955.[10]

| Purpose | Total used, million gallons daily |
|---|---|
| Steam power | 1,574 |
| Alumina reduction | 515 |
| Oil refining | 426 |
| Chemical manufacturing | 423 |
| Sugar refining | 383 |
| Papermaking | 122 |
| Other | 304 |
| Total | 3,747 |

## METALS

**Aluminum.**—Two major developments during 1956 were noteworthy. Kaiser Aluminum & Chemical Corp. began constructing a 500,000-ton alumina plant at Gramercy, midway between New Orleans and Baton Rouge, at an estimated cost of $60 million. A deep-water dock was to be constructed to accommodate specially built ore carriers bearing Jamaica ores. Kaiser was erecting another plant at Gramercy for producing soda ash from nearby salt deposits (soda ash is used in producing alumina). After completion of the project, Kaiser then would have alumina plants at Baton Rouge and Gramercy and, in addition to two reduction plants in Washington, a reduction plant at Chalmette near New Orleans. The added alumina will be used to supply the new Kaiser plant at Ravenswood, W. Va. At Chalmette construction was begun on a ninth potline, which would raise capacity of aluminum metal 27,500 tons to 247,500 tons per year.

At Burnside, just north of Gramercy, Olin Revere Metals Corp. prepared to erect a 345,000-ton alumina plant. The alumina from this plant will be shipped up the Mississippi River to Clarington, Ohio. The plant will have an initial annual capacity to process 700,000 tons of bauxite into 345,000 tons of alumina. Plans also were made to build three large bauxite ore carriers to haul raw ore from Dutch Guiana to a projected plant-site dock.

Louisiana has become a leader in the production of alumina and in the aluminum industry because of the availability of the waterway to import ores and ship finished alumina, abundant fuel, and local economically available salt to produce soda ash. The increasing importance of Jamaican bauxite for alumina production in this country augments this leading position.

**Nickel and Cobalt.**—Promising results from pilot-plant reduction of nickel and cobalt ores received from Moa Bay, Cuba, by Freeport Sulphur Co. led to a company decision to build a commercial plant at Braithwaite, La. Orignial estimates of annual capacity were 30 million pounds of nickel and 3 million pounds of cobalt. These capacity figures were subject to upward revision, pending negotiation of a Government purchasing contract.

[10] Louisiana Department of Public Works, Water: Baton Rouge, La., 1956, pp. 5, 8–10, 16.

Digitized by Google

## REVIEW BY PARISHES

Geographically, mineral production was well distributed among the parishes. Of the 64 parishes in the State, 62 produced 1 or more of the minerals recovered. Gaseous and liquid hydrocarbons were produced in 58 parishes and other minerals in 40. In value of production, however, mineral production was concentrated. Over one-third of the value of all minerals produced in Louisiana during 1956 was from Plaquemines, Lafourche, and Terrebonne Parishes. Sixty-three percent of the value was produced in the top 10 parishes.

**TABLE 30.—Value of mineral production in Louisiana, 1955–56, by parishes[1 2]**

| Parish | 1955 | 1956 | Change, percent | Minerals produced in 1956 in order of value |
|---|---|---|---|---|
| Acadia | $42,725,285 | $48,815,704 | 14 | Petroleum, natural gas, natural-gas liquids. |
| Allen | 4,937,427 | 6,425,890 | 30 | Petroleum, natural gas. |
| Ascension | 695,274 | 620,419 | −11 | Do. |
| Assumption | 4,066,515 | 4,788,213 | 18 | Do. |
| Avoyelles | 3,521,279 | 3,302,576 | −6 | Petroleum, natural-gas liquids, natural gas. |
| Beauregard | 11,724,869 | 12,967,393 | 11 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Bienville | 4,188,064 | 4,794,971 | 14 | Natural gas, petroleum, natural-gas liquids, clays. |
| Bossier | 23,403,541 | 25,913,404 | 11 | Natural gas, petroleum, natural-gas liquids, sand and gravel. |
| Caddo | 46,138,322 | 38,511,466 | −17 | Petroleum, natural gas, natural-gas liquids, sand and gravel, clays. |
| Calcasieu | 41,770,020 | 42,251,350 | 1 | Petroleum, natural gas, salt, sulfur, natural-gas liquids, lime. |
| Caldwell | 289,971 | 311,954 | 8 | Natural gas, petroleum. |
| Cameron | 43,325,279 | 53,504,104 | 23 | Petroleum, natural gas, salt, oystershell. |
| Catahoula | 2,541,187 | 3,389,504 | 33 | Petroleum, sand and gravel, natural gas. |
| Claiborne | 26,117,086 | 25,913,705 | −1 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Concordia | 14,827,095 | 15,490,115 | 4 | Petroleum, natural gas. |
| De Soto | 4,424,050 | 7,561,434 | 71 | Natural gas, petroleum. |
| East Baton Rouge | 12,855,612 | 12,828,342 | ---------- | Cement, petroleum, natural gas, clays, sand and gravel, sulfur, stone. |
| East Carroll | 1,359 | ---------- | ---------- | |
| East Feliciana | [3] | [3] | ---------- | Sand and gravel. |
| Evangeline | 13,286,533 | 13,257,838 | ---------- | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Franklin | 2,245,409 | 2,823,163 | 26 | Petroleum, natural gas. |
| Grant | 457,354 | 952,554 | 108 | Sand and gravel, petroleum, natural gas. |
| Iberia | 56,449,768 | 59,750,389 | 6 | Petroleum, salt, natural gas, clays, sand and gravel. |
| Iberville | 20,339,756 | 21,223,185 | 4 | Petroleum, salt, natural gas, natural-gas liquids. |
| Jackson | 71,531 | 54,652 | −24 | Natural gas. |
| Jefferson | 34,925,550 | 35,437,118 | 1 | Petroleum, natural gas, oystershell, natural-gas liquids. |
| Jefferson Davis | 23,635,089 | 27,355,476 | 16 | Petroleum, natural gas, sand and gravel, natural-gas liquids. |
| Lafayette | 1,259,649 | 2,525,973 | 101 | Petroleum, natural gas, clays. |
| Lafourche | 94,244,360 | 100,513,925 | 7 | Petroleum, natural gas, sulfur, oystershell. |
| La Salle | 17,529,383 | 16,081,583 | −8 | Petroleum, natural gas, sand and gravel. |
| Lincoln | 15,539,861 | 18,233,772 | 17 | Natural-gas liquids, natural gas, petroleum, clays. |
| Livingston | 418,006 | 400,367 | −4 | Petroleum, sand and gravel, natural gas. |
| Madison | 1,473,650 | 1,449,896 | −2 | Petroleum, natural gas. |
| Morehouse | 1,787,405 | 1,815,936 | 2 | Natural gas, petroleum, sand and gravel. |
| Natchitoches | 334,305 | 273,702 | −18 | Petroleum, natural gas, clays. |
| Orleans | 7,689,058 | 7,554,511 | −2 | Cement, oystershell, clays, sand and gravel, petroleum, natural gas. |
| Ouachita | 3,129,725 | 3,325,549 | 6 | Natural gas, sand and gravel, petroleum, natural-gas liquids, clays. |
| Plaquemines | 214,536,374 | 260,398,432 | 21 | Petroleum, sulfur, natural gas. |
| Pointe Coupee | 7,390,674 | 6,864,429 | −7 | Petroleum, natural gas, clays. |
| Rapides | 2,866,086 | 2,815,667 | −2 | Petroleum, sand and gravel, natural-gas liquids, clays, natural gas. |
| Red River | 764,814 | 529,034 | −31 | Petroleum, natural gas. |
| Richland | 16,296,225 | 18,506,549 | 14 | Petroleum, natural-gas liquids, natural gas. |
| Sabine | 386,505 | 388,823 | 1 | Petroleum. |
| St. Bernard | 202,906 | 438,584 | 116 | Oystershell, petroleum, natural gas. |

See footnotes at end of table.

Digitized by Google

**TABLE 30.—Value of mineral production in Louisiana, 1955–56, by parishes[1 2]—Continued**

| Parish | 1955 | 1956 | Change, percent | Minerals produced in 1956 in order of value |
|---|---|---|---|---|
| St. Charles | $23, 923, 298 | $23, 560, 585 | −2 | Petroleum, natural gas, natural-gas liquids, oystershell. |
| St. Helena | | (3) | | Sand and gravel. |
| St. James | 5, 030, 377 | 4, 807, 564 | −4 | Petroleum, natural gas, oystershell. |
| St. John the Baptist | 332, 909 | 264, 427 | −21 | Natural gas, petroleum. |
| St. Landry | 32, 442, 141 | 36, 372, 640 | 12 | Petroleum, natural-gas liquids, natural gas. |
| St. Martin | 40, 039, 812 | 40, 394, 993 | 1 | Petroleum, natural gas, salt, natural-gas liquids, oystershell. |
| St. Mary | 56, 113, 795 | 65, 302, 139 | 16 | Petroleum, natural gas, natural-gas liquids, oystershell. |
| St. Tammany | 1, 707, 409 | 1, 820, 551 | 7 | Oystershell, sand and gravel, natural gas, petroleum clays. |
| Tangipahoa | 1, 303, 081 | 782, 385 | −40 | Sand and gravel, clays. |
| Tensas | 6, 283, 039 | 8, 020, 206 | 28 | Petroleum, natural gas. |
| Terrebonne [4] | 86, 461, 459 | 94, 780, 432 | 10 | Petroleum, natural gas, natural-gas liquids, sulfur. |
| Union | 9, 067, 183 | 9, 572, 932 | 6 | Natural gas, natural-gas liquids, petroleum. |
| Vermilion | 36, 872, 230 | 42, 311, 729 | 15 | Petroleum, natural gas, natural-gas liquids. |
| Washington | 830, 805 | 1, 041, 305 | 25 | Sand and gravel, natural gas, petroleum. |
| Webster | 27, 894, 266 | 29, 666, 620 | 6 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| West Baton Rouge | 1, 064, 553 | 930, 986 | −13 | Petroleum, natural gas. |
| West Carroll | 334, 981 | 473, 796 | 41 | Natural gas. |
| West Feliciana | | 907, 028 | | Sand and gravel. |
| Winn | 2, 235, 447 | 2, 291, 546 | 3 | Salt, gypsum, petroleum, natural gas. |
| Undistributed | 1, 749, 113 | 8, 185, 908 | | |
| Total [5] | 1, 156, 637, 000 | 1, 281, 849, 000 | | |

[1] Vernon Parish not listed because no production was reported.
[2] Value of petroleum, natural gas, and natural-gas liquids by parishes based on data from Louisiana Department of Conservation, Annual Oil and Gas Report, 1956.
[3] Figure withheld to avoid disclosing individual-company confidential data; value included with "Undistributed."
[4] Sulfur value not included.
[5] Total has been adjusted to eliminate duplicating value of clays, stone, and shell.

**Acadia.**—Petroleum recovery in Acadia Parish, was 11 percent higher than in 1955; natural gas was 18 percent greater. At two natural-gasoline and cycle plants at Church Point and the cycling plant at Egan, over $3 million of natural-gas liquids was extracted from natural gas. The Canal Refining Co. skimming and cracking plant at Church Point had a daily crude-oil capacity of 900 barrels and a cracking capacity of 700 barrels of gasoline. The expansion program was expected to add 200 barrels of crude-oil capacity. South Mermentau and South Rayne gasfields were discovered during 1956 in Acadia Parish.

**Beauregard.**—Crude petroleum, natural-gas liquids, natural gas, and sand and gravel, in order of value, were produced during the year. Two natural-gasoline and cycle plants recovered natural-gasoline and liquefied-petroleum products in Beauregard Parish—1 at Merryville using the absorption process and 1 at Longville using the compression process. The 10.6 billion cubic feet of natural gas and 3.5 million barrels of crude petroleum recovered represented gains of 6 and 9 percent, respectively.

Building sand and paving gravel were recovered by the C. A. Arnold Sand and Gravel Co. portable plant at Merryville. H. W. Holeman Sand and Clay Co. also produced paving gravel.

**Bossier.**—The Bossier Parish Police Jury produced gravel for public-highway construction during 1956. Expanded perlite was manufactured at Bossier City by Southwestern Perlite Co. for plaster and other



Digitized by Google

lightweight structural uses. Natural-gasoline and cycle products produced at 2 plants in Haughton and 1 at Benton were valued at $3.8 million. Crude-petroleum recovery increased 6 percent to 3.4 million barrels. Alden Bridge, Bolinger, and Crossway Bayou oilfields were discovered during the year. Natural-gas output (101 billion cubic feet) was 2 percent higher than in the preceding year. Calumet Refining Co. operated a lube-asphalt refinery at Princeton that had a capacity of 950 barrels of crude oil daily.

**Caddo.**—Building brick was manufactured by the Arklatex Face Brick Co. near Mooringsport from clays produced locally. The plant was shut down temporarily in December 1956. In the vicinity of Shreveport the Meriwether Sand Co., Inc., operated a dredge for producing washed and screened sand and gravel, which was used in building and highway construction. The 10.5 million barrels of crude petroleum recovered in 1956 constituted about four-fifths of the total value of minerals produced in the parish. Output of natural-gasoline and cycle products from the nine plants in the parish was valued at $3 million. Natural-gas recovery of 41 billion cubic feet in 1956 represented an increase of 46 percent. A new gas field (Metcalf) was discovered in June. The Hosston and Ida refineries operated during the year with a daily combined capacity of 1,800 barrels of crude oil.

**Calcasieu.**—Quicklime for manufacturing alkalies was produced from oystershell in the rotary kilns of the Olin Mathieson Chemical Corp. at its plant near Lake Charles. Brines were used at this plant for the manufacture of soda ash.

Frasch sulfur was produced by Jefferson Lake Sulphur Co. from its mine at Starks Dome, 6 miles south of Starks. Sulfur also was recovered by the contact method by Cities Service Refining Corp., both as sludge sulfur from refining and from hydrogen sulfide in the liquid purification of gas.

Salt brines for manufacturing chlorine were produced from wells in salt domes in the parish by Columbia-Southern Chemical Corp.

The 1956 value of natural-gasoline and cycle products, recovered at absorption plants in Lake Charles and Iowa, was $2.3 million. Natural-gas value increased 6 percent, but the value of crude petroleum declined 4 percent. Carbon black was produced at a furnace-black plant at West Lake. Cities Service Refining Corp. and Continental Oil Co. operated refineries in Lake Charles, which had a combined capacity of 237,000 barrels of crude oil daily and a cracking capacity of 70,485 barrels of gasoline daily. Two new gasfields were discovered in the parish during 1956.

At a newly constructed plant at Lake Charles, Magnet Cove Barium Corp., ground barite for use as a weighting material in oil-well drilling muds. Work continued on the Lone Star Cement Co. new cement plant near Lake Charles. Construction of a new anhydrous ammonia plant and an ethylene plant was planned near Lake Charles.

**Cameron.**—Natural gas from Cameron Parish increased 27.5 percent to 153 billion cubic feet. Crude-petroleum recovery was 19 percent higher. Three new gasfields and the Grosse Savanne oilfield were discovered in 1956.

At Hackberry Olin Mathieson Chemical Corp. produced salt from wells for making soda ash. Reef shell from coastal waters was recovered in the parish.

Digitized by Google

**Claiborne.**—Petroleum, natural gas, natural-gas liquids, and sand and gravel were produced in Claiborne Parish in 1956. Five plants recovered $4 million worth of natural-gasoline and cycle products. The value of crude petroleum declined 2 percent for a production of 5.7 million barrels; natural-gas decreased 18 percent for a production of 45 billion cubic feet. Gravel used for road construction was produced by George H. Owens at his plant in Arcadia. A new oilfield, Northwest Colquitt, was discovered in mid-October.

**Condordia.**—Nearly 5.2 million barrels of crude petroleum and 3.7 billion cubic feet of natural gas were obtained in 1956. Quantitatively, this was an increase of 6 percent and a decrease of 8 percent, respectively.

**East Baton Rouge.**—Miscellaneous clay for manufacturing brick was mined by the Acme Brick Co. at Baton Rouge. Ideal Cement Co. produced clay as a raw material for manufacturing cement at its Baton Rouge plant. Oystershell was used as the basic material for producing general-use, high-early-strength, and masonry cements at the Ideal Cement plant. A new kiln, raw mill, and finish mill were installed in May 1956.

Consolidated Chemical Industries, Inc., recovered sulfur as a byproduct in the liquid purification of gas by the Claus process at its Baton Rouge plant.

Sand and gravel was produced by two operators near Baton Rouge for construction paving and as railroad ballast. The State of Louisiana Highway Department produced miscellaneous stone for road construction.

During the year, 1.8 million barrels of crude petroleum and 3.3 billion cubic feet of natural gas were produced. The largest refinery in the United States was operated at Baton Rouge by Esso Standard Oil Co. The crude-oil capacity was 308,000 barrels a day and the cracked-gasoline capacity totaled 81,700 barrels a day. Two new plastic plants were planned for the parish, using available refinery waste gases.

Salt was used by Allied Chemical & Dye Corp. for producing industrial chemicals.

Imported Jamaica bauxite ore was processed into alumina at the Kaiser Aluminum & Chemical Corp. plant at North Baton Rouge.

**Evangeline.**—In order of value, crude petroleum, natural-gas liquids, natural gas, and sand and gravel were produced in Evangeline Parish in 1956. The total value of mineral output remained about the same as in 1955. Recovery of natural-gas liquids by plants at Easton, Basile, Ville Platte, and Mamou amounted to 40 million gallons in 1956. The 2.4 million barrels of crude petroleum and 21 billion cubic feet of natural gas recovered during the year represented 8- and 12-percent decreases, respectively. At Ville Platte a furnace-type plant produced carbon black. Gifford-Hill & Co., Inc., at Turkey Creek, dredged and washed sand and gravel for structural uses, paving, road construction, and railroad ballast.

**Iberia.**—In total value of mineral production, Iberia ranked fifth in the State. One-third of the salt yield in Louisiana came from three operations in this parish. Evaporated salt, rock salt, and pressed salt blocks were produced at the underground mine and refinery of International Salt Co., Inc., near Avery Island. Evaporated salt was

Digitized by Google

produced by the vacuum-pan method. Similar operations were conducted by the Morton Salt Co. at Weeks Island and by Jefferson Island Salt Co., Inc., at New Iberia.

At Jefferson Island Iberia Sand & Gravel Co. dredged sand for building purposes. Clay used for building brick was mined by Mike Baker Brick Co.

Sixteen million barrels of crude petroleum and 49 billion cubic feet of natural gas were recovered in 1956. Bayou Postillion and Big Bayou Pigeon oilfields and East Bayou Pigeon gasfield were discovered in 1956.

**Iberville.**—Solvay Process Division of Allied Chemical & Dye Corp. produced salt brines from wells near Plaquemines' for use mainly in manufacturing soda ash. Amerada Petroleum Corp. recovered natural gasoline from natural gas at its absorption plant at Plaquemines'. Petroleum and natural-gas output in 1956 amounted to 5.8 million barrels and 16 billion cubic feet, respectively.

**Jefferson.**—Crude petroleum, natural gas, shell, and natural-gas liquids were produced during 1956. Recovery of natural-gas liquids at the absorption plant at Lafitte totaled 3 million gallons. Crude-petroleum production gained 2 percent to 11.1 million barrels, and natural-gas production gained 6 percent to 21.1 billion cubic feet in 1956. The Clark Oil & Refining Corp. operated a petroleum refinery at Marrero. The crude-oil capacity of this plant was 7,500 barrels daily; cracked-gasoline capacity was 975 barrels daily. Three new gasfields and 2 oilfields were discovered in 1956.

National Gypsum Co. began operating its new gypsum-products plant at Westwego. Gypsum was shipped in from Jamaica. Southern Shell Fish Co. of Harvey sold shell for use in concrete. At Avondale, American Cyanamid Co. expanded operations to include production of monomethyl styrene.

**Jefferson Davis.**—Gifford-Hill & Co., Inc., and Witte Gravel Co., operating near Kinder, produced sand and gravel for road paving, construction, and other purposes. The estimated value of the output of natural gasoline and other liquefied-petroleum gases from four plants situated at Jennings, Welsh, and Elton was $2 million. The value of natural gas produced was $11 million—34 percent more than in 1955; the 4.2 million barrels of crude petroleum recovered was 5 percent higher. Evangeline Refining Co., Inc., operated a small skimming refinery at Jennings with a daily crude-oil capacity of 2,000 barrels. The Fontenot gasfield was discovered in April 1956.

**Lafourche.**—Lafourche Parish was the second-ranking producer of petroleum. Natural gas, sulfur, and shell were other commodities produced. The total value of these minerals was 7 percent higher than in 1955. Near Thibodaux, Freeport Sulfur Co. produced sulfur at its Chacahoula mine. Petroleum production (which gained 7 perent) totaled 29.9 million barrels in 1956; the natural-gas value was up 1 percent. Lake Boeuf and Bayou Raphael oilfields and the Lake Fields gasfield were discovered in 1956. The number of exploratory wells drilled in Lafourche was the largest in the State. The parish ranked fifth in geophysical and core-drill prospecting.

**La Salle.**—Near Jena, Quality Gravel Co. produced paving sand and gravel. Petroleum recovery in 1956 was 5.4 million barrels; the natural-gas yield was 3.1 billion cubic feet.

Digitized by Google

**Lincoln.**—Lincoln Parish ranked third in the State as a producer of natural-gas liquids. The value of natural-gas liquids recovered by plants in Ruston, Hilly, and Dubach amounted to $10 million. The 62 billion cubic feet of natural gas produced during the year was 3 percent lower than in 1955. Building and face brick were manufactured by Ruston Brick Works from clays produced from a pit near Ruston. Bentonite also was mined at Ruston by the Filtrol Corp. The clay was used for filtering and bleaching and as drilling mud.

**Orleans.**—Barite was crushed and ground by the Magnet Cove Barium Corp. at the New Orleans mill and grinding plant for weighting material in oil-well drilling mud and for other uses. Limestone shipped into the State was used at the New Orleans plant of the Lone Star Cement Corp. for producing cement. Expanded perlite was manufactured by the Alatex Construction Service, Inc., plant at New Orleans from crude perlite from Western States. The finished material was used in plasters and concrete aggregate. The Flintkote Co. produced artificially colored roofing granules at New Orleans. Vermiculite was exfoliated by the Zonolite Co. at its Burgundy plant, using crude vermiculite imported from other States. Jahncke Service Co., Inc., dredged shell and sand and gravel for concrete and other construction. Sand & Shell, Inc., also dredged shell for use in concrete.

**Plaquemines.**—Over one-fifth of the value of all minerals produced in Louisiana in 1956 was recovered in Plaquemines Parish. Petroleum production for the year was 66.9 million barrels—an increase of 29 percent over 1955. Production of 101 billion cubic feet of natural gas was reported for the parish. Bayou Gentilly and Tiger's Ridge gasfields and the Dalcour oilfield were discovered during the year. Most sulfur recovered in the State originated in the Parish. Grande Ecaille and Garden Island Bay mines, made the parish one of the most important sulfur-producing areas in the Nation. New docking facilities were installed at the Port Sulphur facilities of the Freeport Sulfur Co. A new nickel-colbalt recovery plant was built at Braithwaite.

**Rapides.**—During 1956 the parish had 4 commercial sand and gravel operations: 2 dredges operated near Woodworth; another dredge operated at Alexandria; and a stationary plant produced paving gravel at Glenmore. The United States Forest Service also produced sand and gravel for paving uses.

At Alexandria, Acme Brick Co. produced clay for manufacturing structural clay products. Also at Alexandria, the Louisiana Lightweight Aggregate Co. obtained miscellaneous clay from a canal soilbank for production of lightweight aggregate.

Natural-gas liquids were recovered at Cheneyville by a plant using the absorption process. Over a half million barrels of crude petroleum and small quantities of natural gas also were produced.

**Richland.**—In 1956 the estimated value of natural-gas liquids from the absorption-type plant at Delhi was over $1 million. Gains of 12 percent for petroleum and 33 percent for natural-gas output resulted in an overall gain of 14 percent for the value of the parish mineral production. A contact-type carbon-black plant operated at Rayville.

Digitized by Google

**St. Charles.**—Crude petroleum, natural gas, natural-gas liquids, and shell were produced in St. Charles Parish in 1956. The total value of this output was 2 percent less than in 1955. This total decrease was attributed mainly to declines in the values of petroleum and shell output. The 2 refineries at Norco and Destrehan had a combined daily straight-run capacity of 130,500 barrels of crude oil and a cracking capacity of 35,000 barrels of gasoline. A 40-million-pound-per-year methyl-ethyl ketone plant was planned for Norco.

An adipic acid plant was being constructed at the Barton ammonia plant at Luling. Olin Revere Metals Corp. bought land at Burnside for erecting a 345,000-ton alumina plant to process bauxite into alumina. At Geismar, Wyandotte Chemicals Corp. began constructing an $8-million plant to produce ethylene oxide. Wyandotte was planning to locate an electrolytic chlorine-caustic soda plant at the same location.

Two new gasfields (Kenner and West Pontchartrain Block 41) were found in the parish in 1956.

**St. James.**—Kaiser Aluminum & Chemical Corp. began constructing its Gramercy alumina plant at an estimated cost of $70 million. At the same location, Kaiser was building another plant to convert salt into caustic soda for use in producing alumina. The parish, located in a strategic region between Baton Rouge and New Orleans, seemed destined for rapid and large-scale industrialization. Petroleum and natural gas and a small quantity of shell also were produced in the parish.

**St. Landry.**—The values of recovered crude petroleum and natural gas increased 5 and 7 percent, respectively. About 6.2 million barrels of petroleum and 48 billion cubic feet of natural gas were recovered. St. Landry Parish is the leading producer of natural-gas liquids in the State. The natural-gas liquids were recovered by natural-gasoline plants at Eunice, Krotz Springs, and Opelousas. The Lawtell gasfield was discovered in November 1956.

**St. Martin.**—Petroleum, natural gas, salt, natural-gas liquids, and shell were produced in St. Martin Parish in 1956. The Gordy Salt Co. produced evaporated salt for many chemical and industrial uses from wells and a mill at Breaux Bridge. Shell was dredged from coastal waters for use in construction and industrial activities. Ninety billion cubic feet of natural gas and 10 million barrels of petroleum were produced in the parish during 1956. Natural gasoline and cycle products were recovered from gas at a plant using the absorption method at Breaux Bridge. Two oilfields and two gasfields were discovered during the year. Breaux Bridge Oil Refining Co. plant at Anse La Butte was shut down at the end of 1956.

**St. Mary.**—In order of value, crude petroleum, natural gas, natural-gas liquids, and shell were produced in 1956. Over 16.9 million barrels of petroleum and 101 billion cubic feet of natural gas were produced. Natural gasoline and cycle products were recovered from natural gas at The Texas Co. cycle plant at Berwick. Shell was dredged near Morgan City by the Leftwich Co., Inc. Three furnace-type carbon-black plants operated at Franklin in St. Mary Parish. The Garden City gasfield was discovered in December.

Digitized by Google

**Terrebonne.**—Large quantities of petroleum, natural gas, and natural-gas liquids were recovered in Terrebonne Parish during 1956. The total value of minerals produced was 10 percent higher than in 1955. Petroleum production gained 6 percent, and natural-gas yields were up 13 percent. Natural-gas liquids were recovered at Waterproof by The California Co., using the cycling process. Terrebonne Parish was the leading natural-gas producer. Bayou Rambio, Humphreys, and South Humphreys gasfields were discovered by exploratory drilling in the parish during the year.

Sulfur was recovered from wells in the Bay Ste. Elaine dome near Houma. The new Lake Pelto sulfur property, under development in 1956, is in shallow waters in Terrebonne Parish.

**Vermilion.**—In 1956, 125 billion cubic feet of natural gas and 5.8 million barrels of crude petroleum were produced. The cycle plant at Erath had the largest capacity of natural-gas liquids of any plant in the State. An estimated $10.6 million of natural-gas liquids was recovered. Three gasfields were discovered in the parish in 1956.

**Webster.**—About 1 million short tons of sand and gravel was produced in Webster Parish in 1956; these were plants at Minden, Springhill, and Heflin.

The estimated value of natural-gas liquids recovered by an absorption plant at Heflin and by cycling plants at Cotton Valley and Sarepta totaled $10 million. The value of petroleum production declined 12 percent; natural gas gained 20 percent. A yearly total of 3.8 million barrels of petroleum and 57 billion cubic feet of natural gas were obtained. At Cotton Valley, Cotton Valley Solvents, Inc., operated a skimming plant that had a daily crude-oil capacity of 5,000 barrels.

**Winn.**—In order of value, salt, gypsum, petroleum, and natural gas were produced in Winn Parish during 1956. Anderson & Dunham, Inc., produced gypsum from an open pit at Winnfield for use as a portland-cement retarder and for road-construction maintenance. The Carey Salt Co. produced rock salt and pressed blocks from an underground mine also at Winnfield. During the year, 125,000 barrels of crude petroleum was produced.

Digitized by Google

Digitized by Google

# The Mineral Industry of Maine

**This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Maine.**

By Robert W. Metcalf [1]

MAINE mineral production in 1956 decreased 6 percent in value from the $13 million for 1955 but still was considerably higher than any other recent year. Output decreased chiefly in portland cement, stone, sand and gravel, and feldspar; the value of sand and gravel rose slightly. The production of masonry cement, lime, sheet mica, and slate increased moderately in value.

The chief mineral commodities produced in Maine in 1956 were cement, sand and gravel, and stone. Their total output comprised by far the bulk of Maine mineral production, both in tonnage and aggregate value. The leading counties in terms of value were Knox, Cumberland, Piscataquis, York, and Androscoggin. Of these, Knox County alone had 57 percent and Cumberland County another 7 percent of the total Maine value.

**TABLE 1.—Mineral production in Maine, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Beryllium concentrate | 22 | $12,671 | 12 | $6,696 |
| Cement: | | | | |
| Portland, 376-pound barrels | 2,264,678 | 6,570,449 | (2) | (2) |
| Masonry, do | 83,839 | 304,996 | (2) | (2) |
| Clays | 32,598 | 32,598 | 26,162 | 23,045 |
| Feldspar, long tons | 26,282 | 188,961 | 22,219 | 143,495 |
| Gem stones | (3) | 5,000 | (3) | 500 |
| Lime | (2) | (2) | 11,997 | 179,162 |
| Mica: | | | | |
| Scrap | 71 | 1,922 | 114 | 3,213 |
| Sheet, pounds | 21,121 | 128,721 | 19,913 | 146,437 |
| Peat | 4,670 | 179,544 | (3) | (2) |
| Sand and gravel | 7,528,903 | 2,855,585 | 7,196,019 | 3,085,417 |
| Stone | 1,192,361 | 2,542,228 | 942,478 | 2,238,011 |
| Value of items that cannot be disclosed: Cement (1956), columbium-tantalum concentrate, slate, lithium mineral (spodumene),[4] and value indicated by footnote 2 | ---------- | 677,809 | ---------- | 6,912,327 |
| Total Maine [5] | ---------- | 12,991,000 | ---------- | 12,179,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Weight not recorded.
[4] Data not available.
[5] Total has been adjusted to eliminate duplicating the value of stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## METALS

**Beryllium.**—Recovery of beryl concentrate was nearly half that reported for 1955; the entire output came from Oxford County. Of 5 producers, the 2 leading were Whitehall Co., Inc., at its Newry mine at Newry and William Pechnik at the Dunn mine at North Norway. Most of the beryl was purchased under the strategic materials stockpiling program by General Services Administration Materials Purchase Depot at Franklin, N. H.

**Columbium-Tantalum.**—Production of columbium-tantalum concentrate in Maine increased compared with 1955; in 1956 it was recovered from the Newry mine of the Whitehall Co., Inc., as a byproduct of mica and feldspar mining. The Federal Government purchased the entire output at the GSA depot in Franklin, N.H., for the strategic materials stockpile.

**Manganese.**—Experimental work on recovery of manganese from potential low-grade manganese ores in Maine continued unabated. A progress report on a chloride-volatilization process on Maple Mountain-Hovey Mountain ore indicated that this method was feasible and might also be adapted for use on open-hearth slags and oxide-type ores.[2] Small-scale batch-fluidization tests on ore from the same area indicated that temperatures of 950° C. were necessary to obtain a practicable rate of volatilization of manganese chloride. Fluidization gave results superior to fixed-bed chloridization.[3]

## NONMETALS

**Cement.**—Cement again was Maine's most important mineral product, measured by value, although shipments in 1956 were somewhat less than in 1955. Production came entirely from the Dragon Cement Co. (a division of American-Marietta Co.) at its Thomaston, Knox County, plant. This wet-process plant (its annual capacity was over 2 million barrels) produced largely general-use and moderate-heat cements and some high-early-strength cement. The output of masonry cement prepared by the same firm was higher in 1956 than in 1955. The acquisition of Dragon Cement Co., Inc., by American-Marietta Co., Chicago, Ill., was effective in October in a $30 million exchange of stock. Dragon Cement Co., Inc., also operated a plant at Northampton, Pa.; American-Marietta Co. also produced large quantities of concrete pipe at its cement plants in Alabama and West Virginia. Following the merger and completion of a Marietta expansion program, total annual cement-manufacturing capacity of the new company will exceed 10 million barrels. The Dragon Cement Co. operated one of the oldest cement-making plants in the United States and in 1956 was the only cement manufacturer in the New England States.[4] New deposits northeast of the old quarry area include ade-

[2] MacMillan, R. T., and Turner, T. L., Development of a Chloride-Volatilization Process for Manganese Ores From Aroostook County, Maine; Progress Report: Bureau of Mines Rept. of Investigations 5281, 1956, 31 pp.

[3] Skow, M. L., Kirby, R. C., and Conley, J. E., Chloridization of Maine Manganese Ore; Preliminary Batch-Fluidization Tests on Maple Mountain-Hovey Mountain Samples: Bureau of Mines Rept. of Investigations 5271, 1956, 29 pp.

[4] Wall Street Journal, vol. 148, No. 47, Sept. 6, 1956, p. 5; Pit and Quarry, vol. 49, No. 4, October 1956 p. 23.

Digitized by Google

quate reserves for operating the plant at least 85 years and were being opened by means of a 400-foot access tunnel passing about 100 feet below United States Highway No. 1. Haulage will be by truck through this 33- by 33-foot tunnel to the kilns. Operation of the old quarry will be terminated when the new tunnel is completed.

**Clays.**—Production of clays in Maine in 1956 declined 20 percent in tonnage and 29 percent in value, because, in Cumberland County, 1 firm became inactive and another company decreased its production. Output was the lowest since 1952 and consisted only of miscellaneous or common clay for use in making heavy clay products, mostly building brick. In 1956, 7 open-pit mines were in operation—2 in Androscoggin County, 3 in Cumberland County, 1 in Franklin County, and 1 in Penobscot County. Androscoggin County led as a clay-producing county in 1956, followed in order by Cumberland, Penobscot, and Franklin Counties. The leading producers of clay in the State were again Morin Brick Co., Androscoggin County; and Lachance Bros. Brick Co., Cumberland County.

**TABLE 2.—Clays sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Total | Average per ton |
| 1947–51 (average) | 25,898 | $23,286 | $0.90 | 1954 | 26,872 | $26,872 | $1.00 |
| 1952 | 26,050 | 26,050 | 1.00 | 1955 | 32,598 | 32,598 | 1.00 |
| 1953 | 29,661 | 27,476 | .93 | 1956 | 26,162 | 23,045 | .88 |

**Feldspar.**—Although feldspar production declined 15 percent from the high tonnage of 1955, the 1956 production was considerably higher than in any other recent year. The average value per ton in 1956 declined 10 percent to $6.46 from $7.19 in 1955. Active mines included 2 in Androscoggin County, 1 in Cumberland County, 8 in Oxford County, and 13 in Sagadahoc County. Several other mines produced small tonnages of feldspar in Oxford and Sagadahoc Counties. Mines in Maine produced predominantly potash feldspar. The principal mines in the State were the Bell Minerals Co. LaFlamme and Perham mines in Androscoggin and Oxford Counties, respectively, followed by the Bell Minerals Co. Tamminen mine in Oxford County and the Alex Cunningham Brown mine in Sagadahoc County. Two feldspar-grinding mills were active in the State; one mill at West Paris (Oxford County) ground both purchased and company-mined feldspar, and the other at Topsham (Sagadahoc County) processed only purchased feldspar. The most important market for Maine ground feldspar was pottery manufacture, including tile, sanitary ware, and electrical porcelain. Sizable quantities also were used in soaps and abrasive products.

**Gem Stones.**—Gem stones produced in Maine in 1956 had about one-tenth the value of those reported for 1955. Although the county of origin of most of this gem material is not known, the discoveries undoubtedly were largely from Oxford and Sagadahoc Counties, where occur numerous pegmatites rich in feldspar, mica, and other associ-

Digitized by Google

ated minerals. Included in the gem stones total were small quantities of amethyst and rose quartz from Oxford County.

**Gypsum.**—The United States Gypsum Co. (Chicago, Ill.) used crude gypsum from its quarries in Nova Scotia, Canada, at its Lisbon Falls (Androscoggin County) plant. The company announced plans in 1956 to increase the output of this plant about 40 percent. Products manufactured at the mill include insulation board, tile, planks, building board, and sheathing.[5]

**Lime.**—The Rockland-Rockport Lime Co., Rockland, Knox County, produced largely quicklime used for chemical purposes in paper manufacture. Some hydrated lime for agricultural use also was sold.

**Lithium Mineral (Spodumene).**—One firm in Oxford County recovered spodumene occurring as a byproduct of feldspar and mica mining.

**Mica.**—Output of sheet mica was 6 percent less than in 1955, although the value increased 14 percent. In referring to sheet mica, hand-cobbed material has been converted to full-trim. Nearly all sales of sheet mica were made through the GSA Franklin (N. H.) Materials Purchase Depot for the national strategic stockpile. Average realization per pound in 1956 was $7.35 compared with $6.09 in 1955. Production and value of scrap mica in 1956 rose over 60 percent in both quantity and value compared with 1955; average value per ton also increased from $27.07 per short ton in 1955 to $28.18 in 1956. In 1956, 12 operators produced mica at 13 mines in Oxford County; some output also came from small mines in that county. A small quantity of punch and circle mica and some scrap mica were produced, but neither mine nor county was identified. Some of the mica mined in Maine was shipped to the GSA Spruce Pine (N. C.) Purchase Depot; a small quantity went to the Custer (S. Dak.) Purchase Depot. No output was specifically reported from Sagadahoc County in 1956.

**Nitrogen Compounds.**—Contributing to an increased output of anhydrous ammonia in the United States in 1956 was a newly built 125-ton-per-day plant at Searsport in Waldo County.

**Sand and Gravel.**—Production of sand and gravel in Maine decreased 4 percent compared with 1955. Value of output rose 8 percent to more than $3 million. Commercial shipments in 1956 increased more than 40 percent compared with 1955, and the value of commercial shipments by more than 25 percent, owing to accelerated road- and industrial-construction activity. Government-and-contractor production totaled only 76 percent of the total tonnage compared with 84 percent in 1955. Building or structural sand and gravel comprised 9 percent of the total; most of the remainder (89 percent) was paving gravel. The leading producer, the Maine State Highway Commission, either mined or produced material under contract in every county. The principal counties producing in 1956 were Cumberland, Penobscot, Aroostook, Androscoggin, and York.

[5] Rock Products, vol. 59, No. 6, June 1956, p. 49.

Digitized by Google

**TABLE 3.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Average per ton | Short tons | Value | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Structural | 193,093 | $178,663 | $0.93 | 220,749 | $165,900 | $0.75 |
| Paving | (1) | (1) | (1) | 326,907 | 143,529 | .44 |
| Railroad ballast | | | | 383 | 273 | .71 |
| Gravel: | | | | | | |
| Structural | 215,153 | 200,024 | .93 | 406,825 | 438,108 | 1.08 |
| Paving | 489,476 | 340,763 | .70 | 601,938 | 345,380 | .57 |
| Railroad ballast | 52,485 | 24,575 | .47 | 32,067 | 8,939 | .28 |
| Other | 113,586 | 72,975 | .64 | 84,208 | 35,167 | .42 |
| Undistributed [2] | 129,753 | 86,476 | .67 | 18,398 | 9,379 | .51 |
| Total | 1,193,546 | 903,476 | .76 | 1,691,475 | 1,146,675 | .68 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Structural | 270 | 27 | .10 | | | |
| Paving | 367,828 | 110,261 | .30 | 331,436 | 189,500 | .57 |
| Gravel: | | | | | | |
| Structural | 20,148 | 1,864 | .09 | 16,835 | 5,892 | .35 |
| Paving | 5,947,111 | 1,839,957 | .31 | 5,156,273 | 1,743,350 | .34 |
| Total | 6,335,357 | 1,952,109 | .31 | 5,504,544 | 1,938,742 | .35 |
| Grand total | 7,528,903 | 2,855,585 | .38 | 7,196,019 | 3,085,417 | .43 |

[1] Included with "Undistributed."
[2] Includes paving-sand (1955); engine and other sands (1956).

**Slate.**—Slate was produced in Maine at an underground mine and adjacent mill at Monson, Piscataquis County. Electrical slate, especially switchboard panels, and flagging were the principal products marketed.

**Stone.**—Output of stone in Maine in 1956 decreased 21 percent in tonnage and 12 percent in value compared with 1955. This decline was shared by both dimension stone (all granite) and crushed and broken stone (mostly limestone and sandstone). In addition to granite, sandstone, and limestone, a small tonnage of miscellaneous stone (gneiss) was quarried in 1956. Twelve commercial quarries were active—7 in granite, 3 in limestone, and 2 in sandstone. Six granite quarries produced dimension stone and the other yielded crushed or broken stone only. Two dimension-stone quarries also yielded crushed or broken granite. Dimension stone produced included dressed architectural stone and curbing and flagging. Crushed or broken sandstone and granite were used principally for road construction and riprap; crushed or broken limestone was used in agriculture, cement and lime, and riprap. In order of tonnage, the leading counties were Knox, Cumberland, and Penobscot and in order of value Knox, York, and Cumberland.

## MINERAL FUELS

**Peat.**—Peat was recovered from bogs in Hancock and Washington Counties in 1956 and sold for agricultural purposes.

Digitized by Google

ated minerals. Included in the gem stones total were small quantities of amethyst and rose quartz from Oxford County.

**Gypsum.**—The United States Gypsum Co. (Chicago, Ill.) used crude gypsum from its quarries in Nova Scotia, Canada, at its Lisbon Falls (Androscoggin County) plant. The company announced plans in 1956 to increase the output of this plant about 40 percent. Products manufactured at the mill include insulation board, tile, planks, building board, and sheathing.[5]

**Lime.**—The Rockland-Rockport Lime Co., Rockland, Knox County, produced largely quicklime used for chemical purposes in paper manufacture. Some hydrated lime for agricultural use also was sold.

**Lithium Mineral (Spodumene).**—One firm in Oxford County recovered spodumene occurring as a byproduct of feldspar and mica mining.

**Mica.**—Output of sheet mica was 6 percent less than in 1955, although the value increased 14 percent. In referring to sheet mica, hand-cobbed material has been converted to full-trim. Nearly all sales of sheet mica were made through the GSA Franklin (N. H.) Materials Purchase Depot for the national strategic stockpile. Average realization per pound in 1956 was $7.35 compared with $6.09 in 1955. Production and value of scrap mica in 1956 rose over 60 percent in both quantity and value compared with 1955; average value per ton also increased from $27.07 per short ton in 1955 to $28.18 in 1956. In 1956, 12 operators produced mica at 13 mines in Oxford County; some output also came from small mines in that county. A small quantity of punch and circle mica and some scrap mica were produced, but neither mine nor county was identified. Some of the mica mined in Maine was shipped to the GSA Spruce Pine (N. C.) Purchase Depot; a small quantity went to the Custer (S. Dak.) Purchase Depot. No output was specifically reported from Sagadahoc County in 1956.

**Nitrogen Compounds.**—Contributing to an increased output of anhydrous ammonia in the United States in 1956 was a newly built 125-ton-per-day plant at Searsport in Waldo County.

**Sand and Gravel.**—Production of sand and gravel in Maine decreased 4 percent compared with 1955. Value of output rose 8 percent to more than $3 million. Commercial shipments in 1956 increased more than 40 percent compared with 1955, and the value of commercial shipments by more than 25 percent, owing to accelerated road- and industrial-construction activity. Government-and-contractor production totaled only 76 percent of the total tonnage compared with 84 percent in 1955. Building or structural sand and gravel comprised 9 percent of the total; most of the remainder (89 percent) was paving gravel. The leading producer, the Maine State Highway Commission, either mined or produced material under contract in every county. The principal counties producing in 1956 were Cumberland, Penobscot, Aroostook, Androscoggin, and York.

[5] Rock Products, vol. 59, No. 6, June 1956, p. 49.

Digitized by Google

The United States Army Engineers also contracted for sizable quantities of paving sand and gravel. The Maine State Highway Commission quarried quartzite for roadbuilding purposes.

**Cumberland.**—Lachance Bros. Brick Co. (Gorham), Fred S. Liberty & Son (North Yarmouth), and Royal River Brick Co. (Cumberland Center), mined miscellaneous clay for use in making brick. Joseph A. Blais, Jr. (Portland), did not operate in 1956. Structural and paving sand and gravel were produced from open pits by Cumberland Sand & Gravel Co., Inc., Cumberland Center; H. E. Hackett, Topsham; P. E. Hamlin, Falmouth; Carl F. Hartley (Hartley Gravel Co.), Brunswick; Fred H. Jordan, South Portland; Leroy S. Prout, Scarboro; Charles W. Qualey, Gray; and Maynard W. Robinson, Cumberland Center. Paving sand and gravel also was produced with its own crews by Maine State Highway Commission in Cumberland County for road construction. Quartzite for use as concrete aggregate, roadstone, railroad ballast, and riprap was quarried by Blue Rock Quarry, Westbrook. The Maine State Highway Commission produced quartzite for use in roadway maintenance and construction. Feldspar was produced from the Tryon Mountain mine in Pownal by Joseph Poulin (Brunswick).

**Franklin.**—Farmington Brick Co. (Temple) produced a small quantity of miscellaneous clay for use in making common brick. Structural and paving sand and gravel were produced in Franklin County by four individuals: Donald C. Ames, New Sharon; E. N. Barry, Farmington; Omer Beisaw, Jay; and Thomas A. Skolfield, Weld. Paving sand and gravel also was mined by Maine State Highway Commission crews for road construction.

**Hancock.**—Dressed dimension granite for construction use, paving blocks, and curbing was produced by Joseph Musetti at Joe's quarry (Hall Quarry). Exterior architectural stone was produced by Grenci & Sons, Inc., at its Hall Quarry operation. This stone was used in the New York and New Jersey approaches to the third tube of the Lincoln Tunnel and in construction work at Maryknoll Seminary, Glen Ellyn, Ill. Both the Musetti and the Grenci product is marketed under the name of Somes Sound pink granite.

T. W. Carlisle, Blue Hill, and Alvin R. Whitten (Winter Harbor) produced bank-run paving sand and gravel and gravel for which no specific use was reported. The town of Blue Hill produced paving sand. The Maine State Highway Commission mined paving sand and gravel for its own use. Peat was produced by the Richland Peat Mines, Inc., near Penobscot.

**Kennebec.**—Sand and gravel was produced in Kennebec County by V. Dunn (V. E. Dunn & Sons), Augusta; and Rundstrom Bros. and William S. Williams, Gardiner. Structural sand and gravel, paving gravel, and railroad ballast sand and gravel were produced. The Maine State Highway Commission also mined sizable tonnages of paving sand and gravel for its own use. H. E. Sargent, Inc. (near Farmingdale), and the city of Augusta crushed granite for road construction and maintenance.

**Knox.**—Charles R. Wallace & Son (Warren) produced building and paving sand and gravel, and the Maine State Highway Commission mined paving sand and gravel for its own use. Higher prices for repairs, parts, and labor have affected income of commercial producers

Digitized by Google

in this area. Rockland-Rockport Lime Co., Inc., produced quick and hydrated lime from limestone quarried near Rockland. This material was marketed for chemical use in papermaking (quicklime) and for agricultural purposes (hydrated lime).

Dragon Cement Co., a division of American-Marietta Co., produced cement at its plant at Thomaston. Two kilns produced general-use and moderate-heat cements and a smaller quantity of high-early-strength cement. All components of the finished cement were purchased except the cement rock, which was quarried by the company near the plant. Both portland and masonry cements were manufactured. Shipments were distributed to New England States. In spite of a 12-percent wage increase on May 1 and price increases of 15 cents per barrel effective January 1 and October 1, production was balanced by demand. Hocking Granite Industries, Inc. (Clark Island), quarried granite for riprap, construction, architectural work, paving blocks, and curbing. Crushed limestone for use in manufacturing paper was quarried by Knox Lime Co., Union. The Rockland-Rockport Lime Co. quarried limestone and crushed it for use as riprap, agricultural stone, chemical stone for use in making paper, and raw material for lime manufacture.

**Lincoln.**—Structural gravel was produced by Howard E. Wright & Son near Newcastle and railroad ballast sand and gravel by Arthur D. Henry (Thomaston). The Maine State Highway Commission mined paving sand and gravel for its own use in roadbuilding.

**Oxford.**—Commercial sand and gravel for paving, building, railroad ballast, and unspecified uses was produced in Oxford County by Merton Charles, Fryeburg; Leo Mallett, Mexico; Homer A. Roberts, Mexico; S. Evelyn Swett, Ridlonville; and Donald E. Wood, Norway. The Maine State Highway Commission produced sand and gravel for use in road construction and maintenance.

Crude feldspar was produced from open-pit operations by Buck & Baker (Tiger Bill mine, West Paris); Bell Minerals Co. (Perham and Tamminen mines, near West Paris, the latter subleased to R. C. Benson, and the Glover-Wilbur mine, South Paris); Pechnik Bros. (Dunn mine at Norway); The Whitehall Co., Inc. (Newry mine, Newry); and Maine Mica Co., location of mine not reported. In addition, a small quantity of feldspar was mined; the output was sold to Bell Minerals Co. The Bell Minerals Co., feldspar mill at West Paris ground both purchased and company-mined material. The ground feldspar was sold principally for ceramic tile, sanitary ware, electrical porcelain, and as an ingredient in soaps, scouring compounds, and abrasives. Distribution of ground feldspar was largely to Ohio, New York, New Jersey, and Wisconsin. The Whitehall Co., Inc., Newry mine yielded, in addition to feldspar and mica, a columbium-tantalum concentrate and a lithium concentrate (spodumene).

Producers of beryl concentrate in 1956 were: Howard I. Baker, from the Tiger Bill No. 2 mine near Greenwood; Mrs. Howard M. Irish, from the Mount Mica mine near South Paris; William Pechnik from the Dunn mine at North Norway; Whitehall Co., Inc., from the Newry mine at Newry; and Alden Wilson, from the Wilson mine at Bethel. Most of the material was sold to the GSA Franklin (N. H.) Material Purchase Depot for the strategic stockpile. A small quantity

Digitized by Google

of amethyst and rose quartz was produced near Stow and Albany, respectively, by Orman McAllister of Lovell.

Twelve operators produced mica at 13 mines in Oxford County in 1956; the source of some production was not identified. Several producers worked the same mine at various times during the year. The more important of these producers were: Lewie Aldridge, Pechnik mine at Norway; Lawrence Anderson, B. B. No. 1 and Dunn mines near Norway, Big Deer mine at Stow, Brown mine at Mason, Wassaman mine at Greenwood, and Wheeler mine at Gilead; Paul Carpenter, Pechnik mine at Norway and Wheeler mine at Gilead; W. Phillips Cole, Deer Hill mine at Stow; Homer Hise, B. B. No. 1 mine at Norway; Maine Mining Co., Hibbs mine at Hebron; Maine Mica Co., Wardwell Mine at Norway; Marjorie Milonich, B. B. No. 1 mine at Norway; Pechnik Bros., Pechnik mine at Norway; Wheeler Bros., Wheeler mine at Gilead; and Whitehall Co., Inc., Newry mine at Newry. Two of these producers—Pechnik Bros., and Whitehall Co., Inc.—reported output of scrap mica. Hand-cobbed and half- and full-trimmed sheet were produced. Most of the hand-cobbed material and all of the half- and full-trim mica was sold to the GSA largely to its Franklin (N. H.) Materials Purchase Depot; and smaller quantities went to the Spruce Pine (N. C.) Purchase Depot.

**Penobscot.**—Sand and gravel produced in Penobscot County in 1956 was used for paving, building, railroad ballast, and various unspecified purposes. Commercial producers were: Bridge Construction Corp., location of deposit not reported; Owen R. Folsom, Stillwater; G. E. Goding & Son, Lincoln; Lane Construction Corp., Bangor; Harl L. McKusick, Dexter; Arthur I. Miles, Old Town; C. M. Page Co., Inc., Orono; and H. E. Sargent, Inc., Stillwater. Sand and gravel for road construction was produced both by their own crews and under contract by the city of Brewer and the Maine State Highway Commission. Quartzite was quarried and crushed by Bridge Construction Corp. at its Read quarry near Orono for highway and road building maintenance. The Maine State Highway Commission also produced quartzite for road construction. Miscellaneous clay was produced by Brooks Brick Co. (Brewer) for use in manufacturing heavy clay products.

**Piscataquis.**—The Portland-Monson Slate Co. produced slate at an underground mine at Monson. This material was processed at the company mill at Monson and sold as electrical and flagging slate. Good demand was experienced throughout the year, and prices were increased in December. Sand and gravel was produced by the Maine State Highway Commission for road construction both by its own crews and under contract. The commission also quarried quartzite for its own use in building roads.

**Sagadahoc.**—Sand and gravel was produced in Sagadahoc in 1956 by Andrew R. Maynard, Topsham; Almon R. Mitchell, Bath; Mrs. Helen G. Morton, Brunswick; and the Maine State Highway Commission, which mined material both with its own crews and under contract. Output was used for structural and paving purposes.

The larger producers of crude feldspar in Sagadahoc County in 1956 were: Augustin Carter, Henry Haskell, and Frank DeBiasio (Aldred mine), near Topsham; Alex Cunningham (Brown mine),

465877—58——36

Digitized by Google

Georgetown; Ray C. Leavitt (Diamond Match mine), John H. Palozzi (Fisher mine), Victor Ponziani (Tedford mine), James Russo (Russo mine), and White's Service (Additon mine), all near Topsham; and Cesare Trusiani (Georgetown mine), Georgetown. These producers and several others sold their output to the Consolidated Feldspar Division, International Minerals and Chemical Corp., which ground feldspar at a mill at Topsham. The ground feldspar was sold mostly for pottery, soaps, and abrasives. Shipments largely were to New England States, Ohio, Pennsylvania and neighboring States. The Topsham Feldspar Co. ground no feldspar in 1956.

**Somerset.**—Sand and gravel for building and paving was produced in Somerset County by Donald J. Gurney, Smithfield, from pits at Fairfield and Smithfield. Gurney's preparation plant was at Smithfield. Sand and gravel for road construction and maintenance also was produced by the Maine State Highway Commission.

**Waldo.**—Clements & Foley (Winterport), A. P. Wyman, Inc. (Waterville), The Bangor and Aroostook Railroad, and the Maine State Highway Commission produced sand and gravel in Waldo County in 1956. Uses included paving and railroad ballast. Architectural granite was produced from the Mount Waldo quarry near Frankfort by Grenci & Ellis, Inc. Stone from this quarry, marketed as Mount Waldo Grey Granite, was used in the Supreme Court Building, Brooklyn, N. Y., and other structures. Northern Chemical Industries began production of anhydrous ammonia from atmospheric nitrogen at its new plant at Searsport and used fuel oil as a source of hydrogen.

**Washington.**—Sand and gravel was mined by Carl Look, Jonesboro; Hill & Sennett, and D. T. Moffett, both of Machias; the Maine Central Railroad; and the Maine State Highway Commission. Grenci & Sons, Inc., produced red granite for exterior architectural use from its Jonesboro quarry. Buildings in which this stone was placed included two State office buildings at Albany, N. Y.; The State Mutual Life Assurance Co. Building, Worcester, Mass.; and the Supreme Court Building, Brooklyn, N. Y. Peat moss was obtained from bogs near Jonesport by Maine Peat Moss, Inc. This material was sold locally for agricultural use for distribution in New England, New York, Pennsylvania, and Ohio.

**York.**—The John Swenson Granite Co. quarried pink granite from its High Pine quarry for use as rubble, architectural stone, riprap, concrete aggregate, and roadstone. The architectural stone was used in exterior construction of the Standard Vacuum Oil Co. Building, Harrison, N. Y.; in the State Mutual Life Assurance Building, Worcester, Mass.; the Cuyahoga County Administration Building, Cleveland, Ohio; and other structures. The Maine State Highway Commission produced sand and gravel and quartzite for road construction and maintenance.

Digitized by Google

# The Mineral Industry of Maryland

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Maryland Department of Geology, Mines and Water Resources.

By James R. Kerr [1] and Jean A. Pendleton [2]

MINERAL PRODUCTION in Maryland in 1956 rose 14 percent in value as compared with the preceding year. Biggest factor in the upswing of State value was the large increase in stone production, particularly crushed limestone which comprised 85 percent of the stone total. The increased value of portland-cement shipments (13 percent), the 34-percent increase in value of coal production, and the 87-percent increase in value of natural-gas shipments also played leading roles in Maryland's increased mineral value. Commodities showing little variation from the previous year's production were clay, sand and gravel, greensand marl, and potassium salts. Production decreased significantly in the lime (29 percent), masonry-cement (13 percent), and talc and soapstone (32 percent) industries. There was no output of slate during the year, as the only slate quarry in the State ceased operation.

**TABLE 1.—Mineral production in Maryland, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 698,257 | $1,264,948 | [2] 635,550 | [2] $1,046,520 |
| Coal | 512,469 | 2,001,743 | 668,875 | 2,684,720 |
| Gem stones | | | ([3]) | 150 |
| Lime | 74,497 | 669,228 | 52,604 | 580,928 |
| Natural gas ..... million cubic feet | 3,116 | 626,000 | 4,619 | 1,169,000 |
| Sand and gravel | 9,694,928 | 12,210,658 | [4] 10,146,905 | [4] 12,395,221 |
| Stone | 5,342,968 | 8,800,044 | 6,228,849 | 13,304,730 |
| Value of items that cannot be disclosed: Ball clay (1956), portland cement, masonry cement, greensand marl, shell (1955), potassium salts, slate (1955), and talc and soapstone | | 11,027,986 | | 10,727,012 |
| Total Maryland [5] | | 35,491,000 | | 40,532,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Incomplete total. Figure for ball clay withheld to avoid disclosing individual company confidential data.
[3] Weight not recorded.
[4] Supersedes figure in commodity chapter.
[5] The total has been adjusted to eliminate duplicating the value of clays and stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## METALS

**Iron and Steel.**—Bethlehem Steel Corp. announced plans to make Sparrows Point, Md., the site of the world's largest steelmaking plant. The capacity of the plant will be increased 2 million tons to a total of 8.2 million. The development will include a blast furnace, 7 additional 350-ton open-hearth furnaces, a roughing mill, a 45-by 90-inch slabbing mill, a battery of coke ovens, additional soaking pits, and steam and electric generating facilities. New ingot capacity should be completed by August 1957. Expansion in finishing capacity includes increased tinplate facilities and a sheared-plate mill. Tinplate additions were put into operation at the end of 1956, and the new plate mill is expected to begin operating during the summer of 1957.

## NONMETALS

**Cement.**—Portland-cement shipments in Maryland in 1956 increased 6 percent over those in 1955. Value went up 13 percent, owing primarily to an increased average value per barrel. Masonry-cement shipments dropped 13 percent below 1955. The bulk of portland and masonry cements produced by two companies were consumed in Maryland, Virginia, District of Columbia, and Pennsylvania. Eleven kilns were active during the year. The North American Cement Corp. reported early in the year addition of a Humboldt four-stage suspension-type preheater to their Hagerstown plant. Both producing companies mined limestone from adjacent properties for cement production. The Lehigh Portland Cement Co. also mined all the shale and sand for use in manufacturing cement.

**Clays.**—The bulk of the clay produced in Maryland in 1956 was miscellaneous clay mined entirely from open-pit mines. Fire clay was mined from 5 open-pit mines and from the only 2 underground clay mines active in the State in 1956. Ball clay was mined from an open pit for use in manufacturing refractories, pottery, stoneware, and floor and wall tile. Most fire clay produced was used for refractories. The chief uses of miscellaneous clay were for manufacturing heavy clay products and in manufacturing cement. Baltimore and Prince Georges were the leading clay-producing counties.

**Gem Stones.**—The Mineralogical Society of Pennsylvania, Lapidary Section, collected williamsite, an impure apple-green variety of serpentine, at the limestone quarries near Conowingo, Md. The gem was used principally for ornamental purposes.

**Gypsum.**—Crude imported gypsum was calcined at the Baltimore plant of the National Gypsum Co. Four kettle kilns fired by oil and having a capacity of 670 tons per day produced a considerable tonnage of calcined gypsum for the manufacture of plasters, lath, and wallboard.

**Iron Oxide Pigments.**—Sales of finished natural and manufactured iron oxide pigments were reported by Mineral Pigments Corp., Laurel. The largest selling type of pigment was natural red iron oxide.

**Lime.**—Since 95 percent of the lime production in Maryland was utilized for agricultural purposes, the adverse weather conditions

Digitized by Google

during early spring and late fall caused a 29-percent drop in total output in 1956. The demand for building lime was also less. A price increase averaging 11 percent was put into effect during the year. Five producers, operating a total of 45 pot kilns using primarily coke as a fuel, had an annual capacity of approximately 80,000 tons of lime.

**Marl, Greensand.**—The Kaylorite Corp. operated an open pit near Dunkirk and processed greensand marl for use as agricultural material.

**Perlite.**—Perlite from crude-ore producers in the west, primarily in Antonito, Colo., and Socorro, N. Mex., was processed at two plants in Maryland. The expanded product was used as plaster and concrete aggregate, soil conditioner, and as a filtering agent. A reduced margin of profit was reported to be due to increased ore prices and increased freight rates, coupled with the inability to raise prices of the finished product and still compete in a highly competitive market.

**Potassium Salts.**—Potassium sulfate was prepared from cement clinkers of the North American Cement Corp. Security plant in Washington County as a byproduct of the cement-mill operations.

**Sand and Gravel.**—Output of sand and gravel in Maryland increased 5 percent compared with that in the preceding year. Value of production increased slightly. Structural and paving again dominated as chief uses for sand and gravel; 98 percent of the State output was used for these purposes. A total of 67 commercial operations, mostly fixed plants, and 13 Government-and-contractor operations reported production in 1956. The average number of days commercial pits were active during the year exceeded 240. Prince Georges County was the largest producing county, followed by Baltimore, Anne Arundel, Harford, and Cecil.

Slackened demand was noted by most sand and gravel producers in 1956. Reasons given included: (1) Adverse weather conditions during early spring and late fall months curtailed building and paving, (2) tight money policy limited the number of private homes constructed, and (3) the steel strike caused a delay in some construction

**TABLE 2.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| Sand: | | | | | | |
| Structural | 2,221,341 | $2,399,638 | $1.08 | 2,564,383 | $2,869,436 | $1.12 |
| Paving | 2,817,906 | 3,642,952 | 1.29 | 2,869,200 | 3,215,498 | 1.12 |
| Gravel: | | | | | | |
| Structural | 1,919,447 | 3,349,848 | 1.75 | 2,013,973 | 3,532,198 | 1.75 |
| Paving | 2,612,575 | 2,517,507 | .96 | 2,454,693 | 2,448,635 | 1.00 |
| Undistributed [1] | 123,659 | 300,713 | 2.43 | 244,656 | 329,454 | 1.35 |
| Total | 9,694,928 | 12,210,658 | 1.26 | [2] 10,146,905 | [2] 12,395,221 | 1.22 |

[1] Includes glass sand, grinding and polishing sands (1955), fire or furnace sand, engine sand, filter sand, and other sands, railroad ballast gravel (1955), and other gravel which cannot be shown separately.
[2] Supersedes figure given in commodity chapter.

Digitized by Google

projects. Competition was keen, and the increased cost of wages, equipment, and parts cut the margin of profit as prices remained the same or dropped slightly from the preceding year.

**Stone.**—The output of stone in Maryland in 1956 increased 17 percent in production and 51 percent in value compared with 1955. The increased output of crushed limestone (which comprised 85 percent of the total stone production) accounted for the major portion of the increase in total stone value. A portion of the increased output, particularly the value, can be explained by the fact that 1956 marked the first year for including data on oystershell, which has a high unit value, in the stone total. The bulk of crushed limestone produced was used in manufacturing cement and lime. Baltimore County led in crushed-limestone production, increasing 20 percent over that of the preceding year.

Basalt, marble, granite, and miscellaneous stone (mostly mica schist) also were produced during the year. No dimension sandstone was produced as the Hernwood Quarries reported their quarry idle during the year. However, crushed sandstone (quartzite) for manufacturing silica brick was produced by Harbison-Walker Refractories Co. from a quarry in Cecil County near North East.

Oystershell crushed for use primarily as poultry grit was produced in Baltimore and Dorchester Counties. The fines obtained in

**TABLE 3.—Stone sold or used by producers, 1955–56, by kinds and uses**

| Kind and use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Dimension stone: | | | | |
| Granite: | | | | |
| Building stone: | | | | |
| Rough construction | 27,043 | $205,727 | 11,555 | $97,440 |
| Dressed construction | | | 900 | 22,500 |
| Rubble | | | 21,100 | 52,750 |
| Curbing and flagging | | | 445 | 5,340 |
| Total (approximate short tons) | 27,043 | 205,727 | 34,000 | 178,030 |
| Miscellaneous: Building: | | | | |
| Rough and dressed | 12,074 | 71,124 | 5,705 | 31,113 |
| Rubble and flagging | 1,902 | 14,181 | 4,040 | 44,669 |
| Total | 13,976 | 85,305 | 9,745 | 75,782 |
| Crushed and broken stone: Granite: | | | | |
| Riprap | 22,963 | 52,815 | 22,000 | 55,000 |
| Concrete and roadstone | 55,357 | 158,924 | 54,300 | 112,350 |
| Total | 78,320 | 211,739 | 76,300 | 167,350 |
| Basalt and related rocks | 692,908 | 1,040,345 | 709,703 | 1,200,278 |
| Total | 692,908 | 1,040,345 | 709,703 | 1,200,278 |
| Limestone: | | | | |
| Concrete and roadstone | 3,258,241 | 5,001,433 | [1] 3,958,452 | [1] 6,203,759 |
| Agricultural | 29,502 | 125,413 | 44,507 | 171,403 |
| Miscellaneous | 1,231,230 | 1,899,604 | [2] 1,355,183 | [2] 4,500,816 |
| Total | 4,518,973 | 7,026,450 | 5,358,142 | 10,875,978 |
| Undistributed [3] | 11,748 | 230,478 | 40,959 | 807,312 |
| Grand total | 5,342,968 | 8,800,044 | 6,228,849 | 13,304,730 |

[1] Includes railroad ballast (1956).
[2] Includes riprap, flux, oystershell (1956), and other stone.
[3] Includes dimension limestone, dimension sandstone (1955), crushed sandstone (1956), marble, oystershell (1955), and miscellaneous stone.

Digitized by Google

crushing were utilized as agricultural stone and for soil improvement.

Producers of limestone, which make up 80 percent of the stone value of the State, reported demand from fair to good, wages and prices slightly higher. Some reported adverse weather conditions in the fall caused a considerable loss in business, as the companies could not maintain production.

**Talc and Soapstone.**—Soapstone for use as roofing material, asphalt filler, and foundry facing was produced in Carroll County and talc for use in foundry facings, ceramics, and as asphalt filler in Harford County. Clinchfield Sand & Feldspar Corp. sold its mine and crushing and grinding plants to Liberty Stone Co. in October 1956. Production dropped during the year owing to the slackened production of Clinchfield Sand & Feldspar Corp. before the sale of its property.

**Vermiculite, Exfoliated.**—The Zonolite Co. processed crude vermiculite produced at company quarries in Lincoln County, Mont., and Spartanburg County, S. C. An additional small quantity of imported ore was processed.

## MINERAL FUELS

**Coal.**—Coal production in Maryland continued the trend of recent years, as it increased 30 percent over 1955. Strip production showed a 39-percent increase, underground 23-percent. Production was reported from 93 mines compared with 84 in the preceding year. Many other coal operators producing less than 1,000 tons were also active during the year. Of the total State coal output, 35 percent came from Allegany County and 65 percent from Garrett County. Most underground mines were small, nonmechanized operations, although 36 percent of the underground production (represented by 6 mines) was hand-loaded onto face conveyors. Of the total production, 29 percent was crushed and 6 percent treated before shipment.

**TABLE 4.—Production of coal, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton [1] | | | Total | Average per ton [1] |
| 1947–51 (average) | 1,123,468 | $5,598,329 | $4.98 | 1954 | 421,616 | $1,879,018 | $4.46 |
| 1952 | 587,903 | 2,694,842 | 4.58 | 1955 | 512,469 | 2,001,743 | 3.91 |
| 1953 | 530,590 | 2,441,605 | 4.60 | 1956 | 668,875 | 2,684,720 | 4.01 |

[1] Value received or charged for coal f. o. b. mine, selling cost. (Includes value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

**Coke and Coal Chemicals.**—Bethlehem Steel Corp. maintained production of coke from 11 batteries of 687 slot-type ovens at Sparrows Point producing 3,050,000 tons of coke. Associated coproducts produced were coke breeze, 176,500 tons; 45,626,000 thousand cubic feet of coke-oven gas; 89,178,000 pounds of ammonium sulfate; 36,237,000 gallons of tar; and 14,405,000 gallons of crude light oil. Light-oil derivatives included benzene (9,474,000 gallons), toluene (2,300,000 gallons), and xylene (718,000 gallons).

Digitized by Google

**Natural Gas.**—The output of natural gas in Maryland rose 48 percent in 1956 compared with the preceding year, but the value of output increased 87 percent owing to an increase in average price, from $2.01 to $2.53 per thousand cubic feet at the wellhead. Production in 1956 was again from the Mountain Lake Park field and the Accident field, both in Garrett County.

## REVIEW BY COUNTIES

**Allegany.**—Coal, which contributed over one-third to the mineral value of the county, was reported from 32 underground and 11 strip pits—an increase of 6 over 1955. Moran Coal Co. was the leading producer, followed by Thrasher Contracting & Stripping Co., M. K. Coal Co., Phoenix Big Vein Coal Co., Gary Coal Co., Allegany Engineering Co., Central Sand & Gravel Co., Consolidated Fuel Co., Edna Fuel Co., and P & R Coal Co.

Stone production more than tripled in value owing to opening of a limestone quarry by Fry Coal & Stone Co. near Corrigansville. The Cumberland Cement & Supply Co. continued operations in the county. Over 95 percent of output was used in manufacturing cement.

Cumberland Cement & Supply Co., operator of two fixed sand and gravel plants near Cumberland, reported production of glass sand, engine sand, and structural and paving sand and gravel. Lewis & Hunter produced a small quantity of structural sand.

Fire clay for fire brick and block and mortar was mined by Mount Savage Refractories Co., Mount Savage, and Big Savage Refractories Corp., Frostburg. The Pen-Mar Brick & Supply Co., Cumberland, mined miscellaneous clay for heavy clay products. The value of clay output virtually doubled over 1955 owing primarily to the increased price of fire clay per ton.

**TABLE 5.—Value of mineral production in Maryland, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Allegany | $1,622,867 | $2,438,328 | Coal, stone, sand and gravel, clays. |
| Anne Arundel | (1) | (1) | Sand and gravel, clays. |
| Baltimore | 8,783,773 | 11,268,004 | Stone, sand and gravel, shell, clays. |
| Calvert | (1) | (1) | Sand and gravel, greensand marl. |
| Caroline | ---------- | 17,243 | Sand and gravel. |
| Carroll | (1) | (1) | Cement, soapstone. |
| Cecil | 598,983 | 1,260,542 | Sand and gravel, stone, clays, gem stones. |
| Charles | 11,558 | (1) | Sand and gravel. |
| Dorchester | (1) | (1) | Sand and gravel, shell. |
| Frederick | 2,465,836 | 2,083,948 | Stone, lime, clays. |
| Garrett | 1,997,132 | 3,222,251 | Coal, natural gas, stone, sand and gravel. |
| Harford | 1,478,390 | 1,337,927 | Sand and gravel, stone, talc. |
| Howard | (1) | (1) | Sand and gravel. |
| Kent | (1) | (1) | Sand and gravel, clays. |
| Montgomery | (1) | 80,782 | Stone. |
| Prince Georges | 5,338,506 | (1) | Sand and gravel, clays. |
| Queen Annes | (1) | (1) | Sand and gravel. |
| St. Marys | (1) | (1) | Do. |
| Somerset | 1,600 | 886 | Do. |
| Talbot | 10,759 | (1) | Sand and gravel, clays. |
| Washington | (1) | 8,157,052 | Cement, stone, potassium salts, clays, lime. |
| Wicomico | 79,254 | (1) | Sand and gravel, clays. |
| Worcester | 12,886 | (1) | Sand and gravel. |
| Undistributed [2] | 13,088,990 | 10,665,313 | |
| Total | 35,491,000 | 40,532,000 | |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes values indicated by footnote 1. Excludes value of clays and stone.

Digitized by Google

**Anne Arundel.**—Anne Arundel ranked third in the value of sand and gravel in the State. Sand, primarily for paving and structural purposes, was reported by the following companies: Arundel Corp., from pits near Annapolis, Brooklyn, and Baltimore; the property of R. T. Mohre and V. A. Hare operated by Wright Contracting Co. near Baltimore; Frederick Link Sons, Hanover; and The Brooklyn Corp., Baltimore. The Arundel Corp. also produced fire and furnace sand. Gravel, for road paving, was quarried by Dan Arminger, Owain Owens, Warren Hazard, and Maryland Street & Roads Commission. Alan E. Barton produced sand and gravel. John I. Rogers, a former sand and gravel producer, reported his pit depleted.

The Severn Clay Co., Glen Burnie, mined fire clay for floor and wall tile and sanitary ware.

**Baltimore and Baltimore City.**—First among the 23 mineral-producing counties in Maryland, Baltimore County contributed over 25 percent to the State's mineral value owing primarily to a leading position in output of stone, clay, and oystershell.

Limestone, basalt, and granite were quarried. There was no output of sandstone in 1956, as Hernwood Quarries reported its quarry closed. Harry T. Campbell Sons' Corp. Texas quarry at Texas was the largest source of limestone. The Arundel Corp., Pikesville, and A. A. Dyer, Reisterstown (formerly of Glyndon), were the other limestone producers. Eighty-seven percent of the limestone was crushed for use as concrete aggregate and roastone. Other uses were for agricultural, chemical, and metallurgical purposes, riprap, whiting, asphalt and fertilizer filler, mineral food, poultry grit, and stucco.

The J. E. Baker Co. Blue Mount quarry, White Hall, and The Arundel Corp., Baltimore, quarried basalt for road-paving purposes and as railroad ballast and riprap.

Granite was mined at the Gwynn Falls, Loch Raven, and Butler quarries of Harry T. Campbell Sons' Corp., and the Reckordville quarry of Carl B. Temple. Output was utilized as dressed and rough construction stone, curbing and flagging stone, rubble, riprap, as concrete aggregate and roadstone.

Ball clay was mined by United Clay Mines Corp., White Marsh—the only producer of this type of clay in the State. Miscellaneous clay was produced at the Monument Street plant and the Rossville clay plant of the Baltimore Brick Co. and the Champion Brick Co., both of Baltimore. The miscellaneous clay was used exclusively for heavy clay products, while the ball clay was utilized for various purposes, including pottery and stoneware, refractories, and floor and wall tile.

Oystershell for poultry grit and agricultural purposes was crushed by the Oyster Shell Corp., Baltimore.

Baltimore also was an important center for sand and gravel production; the county ranked second in the State in the value of output. Four operators reported tonnages of both sand and gravel. In order of decreasing value, they were Harry T. Campbell Sons' Corp., Whitemarsh plant, Cowenton; Nottingham Farms, Inc., Joppa Road plant; Harry A. Smuck & Sons, Lansdowne plant; and George W. Schwarz, White Marsh plant, all of Baltimore. Louis H. Richter,

Digitized by Google

Baltimore, and Charles B. Polesne, Fullerton, reported gravel production. The building and paving industries consumed the entire county output.

The National Gypsum Co. calcined imported gypsum for use in manufacturing plasters, lath, and wallboard and as a portland-cement retarder.

Expanded perlite for plaster, concrete, soil conditioning, and filtering was produced by Perma Rock Products, Inc., near Baltimore.

**Calvert.**—Greensand marl was mined near Dunkirk by the Kaylorite Corp.—the only producer in the State. Output was used primarily as soil conditioner.

Small quantities of gravel were produced by Frank Farrell, Oscar S. Bowen, Dorsey Hance, Hammett Gray, Wash Hance, and Calvert Construction Co. Sand and gravel was produced by Melvin Phipps and sand by Stanley Cox. Output was used for road paving.

**Caroline.**—The Maryland Street and Roads Commission reported gravel production from local deposits in the county for use in paving roads.

**Carroll.**—The principal mineral commodity produced in Carroll County was portland cement, manufactured by the Lehigh Portland Cement Co. at Union Bridge. Limestone for use in the cement was quarried by the company at Union Bridge.

Clinchfield Sand & Feldspar Corp. sold its soapstone operations at Marriottsville to the Liberty Stone Co. on October 1, 1956. The Liberty Stone Co. continued its operations at Sykesville; output from both plants was used for roofing, foundry facing, insecticides, and asphalt filler.

**Cecil.**—In order of decreasing value, Mason-Dixon Sand & Gravel Co. (Perryville), McDaniel Sand & Gravel Co., Inc. (North East), Waible, Inc. (Port Deposit), and Manley H. Jones (operator for Arthur D. Johnston, Port Deposit) produced sand and gravel, predominantly for building use. C. Ray Ott, Elkton, and Fred S. Russell, North East, reported output of paving gravel, and Vernon Kincaid reported output of building sand.

Crushed quartzite for silica brick was quarried by Harbison-Walker Refractories Co., North East.

The North East Fire Brick Co. and Fred S. Russell, both of North East, mined fire clay for refractories, such as fire brick and block.

The Mineralogical Society of Pennsylvania, Lapidary Section, collected williamsite (gem stones) at the limestone pits at Conowingo, Md., for ornamental purposes.

**Charles.**—Sand and gravel was produced for building purposes by Irene and Leroy Gamble at their fixed plant near La Plata. Output of paving gravel was reported by the Maryland Street and Roads Commission.

**Dorchester.**—J. Edwin Rosser operated a fixed plant on the River Road, Federalsburg, producing substantial quantities of sand and gravel for building and paving purposes. The company also produced sand for fill and lawn grading. The Maryland Street and Roads Commission reported production of gravel for paving use.

Oystershell were crushed for use as poultry grit and for fertilizer by J. M. Clayton Co., Cambridge.

Digitized by Google

**Frederick.**—Frederick County ranked second in the value of stone and was the larger of the two lime-producing counties. Limestone was quarried and crushed for use by the following five producers, in order of decreasing value: M. J. Grove Lime Co., Frederick; Le Gore Lime Co., Le Gore; S. W. Barrick & Sons, Inc., Woodsboro; Farmers Cooperative Association, Inc., New London; and Everett V. Moser, Middletown. Output was used predominantly (83 percent) as concrete aggregate and roadstone. The balance of production was used for lime (9 percent), railroad ballast (6 percent), and agricultural purposes (2 percent). The product was used primarily for agricultural purposes, although small quantities were employed for mason's lime and in prepared masonry mortar.

Miscellaneous clay was mined by Hudson Supply & Equipment Co., Buckeystown. Output was used for heavy clay products, such as building brick and tile, paving brick, drain tile, and sewer pipe.

**Garrett.**—The leading commodity of Garrett County was coal mined from 36 underground mines and 14 strip pits. The principal underground mines, in order of decreasing tonnage, were W. & W. Coal Co., Stanley Coal Co., Myers Coal Co., Harvey & Evans Coal Co., Inc., and B. B. & K. Coal Co. Primary strip producers were Schell Mining Co., Inc., Moran Coal Co., Thrasher Contracting & Stripping Co., Crambletts Mine, and Phoenix Big Vein Coal Co.

Limestone was quarried at the Fry quarry and the Oakland quarry by Vetter Bros., Inc., Oakland. The company crushed the output, principally for use in roadwork.

Sand for use in building and paving was reported by Silver Knob Sand Co., Inc., the leading producer, and Eagle Rock Sand Co., both of Oakland. A small quantity of sand was hand-screened for mortar and concrete by Jessie F. Graves, Friendsville.

**Harford.**—The largest producer of sand and gravel was Stancill's, Inc., which operated 4 fixed plants—2 at Joppa, 1 at Aberdeen, and 1 at Edgewood. Other plants were operated by Charlestown Sand & Gravel Co., Chestertown; Belcamp Sand & Gravel Co. and Abingdon Sand & Gravel Co., Inc., Abingdon; and Victor Mullin Sand & Gravel Co., Inc., Aberdeen. Output was used for building and paving. W. Noble Hamilton, Havre de Grace, and N. G. Spencer & Son, Abingdon, produced gravel for paving.

The Churchville quarry of Thomas B. Gatch & Sons, Inc., Churchville, yielded a large quantity of basalt, which was crushed for use as concrete aggregate and roadstone. The Maryland Green Marble Co., Cardiff, continued to produce green Maryland verde antique marble for use in building interiors and as terrazzo.

Talc for foundry facings, ceramics, and as asphalt filler was mined by Harford Talc & Quartz Co., Dublin.

There was no slate production in Maryland in 1956, as the Central Commercial Co., Whiteford, dismantled operations.

**Howard.**—Sand was produced by The Arundel Corp. (Laurel) and gravel by Cosca Sand & Gravel Co. (Jessup) for paving purposes.

**Kent.**—Sand and gravel for building and sand for paving was produced by The Kent Concrete Co., Inc., Chestertown, and Maryland Street and Roads Commission, respectively. Kaiss Bros. Sand Co. reported no production owing to depletion of supply.

Digitized by Google

Miscellaneous clay mining continued near Chestertown by the Chestertown Brick Co. The product was used for making building brick.

**Montgomery.**—Mica schist was quarried by Stoneyhurst Quarries, Bethesda, and Shuff & Son Co., Cabin John, for building and flagging. A small quantity of granite for concrete and riprap was reported by Albert D. Battista, Rockville. Frank Pennini quarried miscellaneous stone near Mount Rainier.

William H. McCeney, Jr., sold his sand and gravel plant to Contee Sand & Gravel Co., Inc. No production was reported in 1956.

**Prince Georges.**—One-tenth of Maryland's mineral value was derived from the sand and gravel industry of Prince Georges County. Smoot Sand & Gravel Corp., operating a dredge on the Potomac River, was the leading producer of sand and gravel, followed by S. S. Bevard for Silver Hill Sand & Gravel Co., Washington, D. C.; Contee Sand & Gravel Co., Inc., Laurel; Joseph Smith & Sons, Inc., for Buffalo Sand & Gravel Co., Washington; District Sand & Gravel Co., Silver Hill; Washington Sand & Gravel Co., Washington; and A. H. Smith for Davis Sand & Gravel Corp., Clinton. Sand was produced by Frank A. Bevard for Landover Sand Co., Bowie, and M. & M. Union Sand & Gravel, Inc., Glenn Dale. The Forestville Sand & Gravel Co., Forestville, and Uno Excavating Co., Berwyn, reported gravel. Fifty-five percent of the output was used in road paving and 41 percent for building purposes. Miscellaneous gravel comprised the balance of production.

Prince Georges ranked third in value of clay production. Washington Brick Co., Muirkirk, and West Bros. Brick Co., Washington, D. C., mined miscellaneous clay, primarily for building brick and other heavy clay products. A small portion of the output was used in manufacturing flowerpots. Fire clay for use in foundries and steelworks was mined by William L. Allen, Laurel.

Expanded perlite for use as lightweight aggregate in plaster—the principal use—and concrete aggregate was produced by the Atlantic Perlite Co., near Washington, D. C.

The Zonolite Co. processed crude vermiculite at a plant near Beaver Heights from raw material produced in Spartanburg County, S. C., and Lincoln County, Mont., plus a small tonnage of imported material.

The Mineral Pigments Corp. reported sales of finished natural and manufactured pigments of varying colors; red and yellow iron oxides and magnetic black predominated.

**Queen Annes.**—A small quantity of sand was produced by R. B. Baker & Sons, Inc., Queenstown, for use in building and paving.

**St. Marys.**—The Leonardtown Sand & Gravel Co., Leonardtown, reported output of sand and gravel for building and paving purposes.

**Somerset.**—Gravel for use in road paving was produced by the Maryland Street and Roads Commission.

**Talbot.**—Considerable quantities of gravel for use in paving streets and highways were produced by the State roads commission, Talbot County Highway Department.

Miscellaneous clay for brickmaking was mined by New Brick & Tile Co., Easton.

Digitized by Google

**Washington.**—Washington County ranked second in value of mineral output in Maryland, producing portland and masonry cements, stone, potassium salts, clay, and lime.

Of the two cement-producing counties, Washington was the principal area due to the output of North American Cement Corp. Security plant at Hagerstown. Portland and masonry cements were manufactured, and sulfate of potash was obtained as a byproduct of the cement mill. Limestone also was quarried on the site for use at the cement plant, plus a small quantity sold as roadstone and railroad ballast. Limestone for roadstone, agricultural purposes, and as an inert dust for coal mines was produced at the Pinesburg plant of Fry Coal & Stone Co., Williamsport. The Schetrompf Lime Co., Clear Spring, quarried dimension stone for use as rubble in construction work. Quicklime was produced by the company for agricultural purposes.

Miscellaneous clay (shale) for heavy clay products was mined at the open pit of Victor Cushwa & Sons, Inc., Williamsport.

**Wicomico.**—Richard H. Howard, the leading producer, and Basic Materials Supply Co., both of Hebron, produced sand and gravel for use in paving, plus a small quantity of gravel for building purposes. The Maryland Street and Roads Commission reported gravel production for paving purposes.

The Salisbury Brick Co., Inc., Salisbury, mined miscellaneous clay for heavy clay products.

**Worcester.**—Gravel production was reported by the Maryland Street and Roads Commission for use in road paving.

Digitized by Google

Digitized by Google

# The Mineral Industry of Massachusetts

By Robert W. Metcalf [1]

MASSACHUSETTS mineral production in 1956 was valued at $25 million, an alltime record and 13 percent greater than in 1955, the previous top year. This record was due chiefly to the large increase in both quantity and value of crushed and broken stone in 1956; this category rose 32 percent in tonnage and 35 percent in value over 1955. The output of sand and gravel also rose moderately compared with 1955 and topped 1955 by 6 percent in quantity and 7 percent in value.

Mineral commodities produced in Massachusetts in 1956, in order of importance, were stone, sand and gravel, lime, clay, and peat. Types of stone produced were basalt, granite, limestone, sandstone, and miscellaneous stone (granitic gneiss). In order of value of product, Middlesex County ranked first among Massachusetts counties, followed by Berkshire, Hampden, Essex, and Norfolk. Stone was the principal mineral commodity in Middlesex, Essex, and Hampden Counties, lime in Berkshire, and sand and gravel in Norfolk.

**TABLE 1.—Mineral production in Massachusetts, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 124,832 | $141,654 | 127,547 | $213,682 |
| Lime | 134,952 | 1,957,346 | 134,248 | 2,093,195 |
| Peat | 572 | (2) | 300 | (2) |
| Sand and gravel | 9,580,943 | 8,926,329 | 10,189,425 | 9,519,831 |
| Stone | 4,128,004 | 11,381,164 | 5,441,878 | 13,752,920 |
| Value of items that cannot be disclosed: Mineral fuels and nonmetals | | 5,933 | | 2,800 |
| Total Massachusetts [3] | | 22,109,000 | | 25,085,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total adjusted to eliminate duplicating value of stone.

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Cement.**—The Dragon Cement Co., New York, N. Y., optioned 550 acres of land along the Boston & Albany Railroad between Washington and Hindsdale in Berkshire County as a possible site for a

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

new $10 million cement plant. Consideration of two previously proposed locations—West Stockbridge and North Adams—was dropped because of failure to obtain approval of the local authorities.[2]

**Clays.**—Production of clays in Massachusetts in 1956 was 2 percent higher than in 1955. Miscellaneous or surface clay only was mined and used largely for making building brick and other heavy clay products. The remainder of the clay was manufactured into flowerpots. Clays were mined in 4 counties by 5 firms in 1956. The largest producing county was Plymouth, followed in order of output by Hampden, Bristol, and Middlesex Counties.

**Lime.**—Production of quick and hydrated lime in 1956 declined slightly, although the value rose 7 percent compared with 1955. The average value per ton was $15.59—8 percent higher than in 1955, although 2 percent below that in 1953. The quantity of quicklime sold or used declined 9 percent, while the tonnage of hydrated material rose 10 percent in 1956 compared with 1955. The greater part of the output of both quick and hydrated lime was consumed for chemical and industrial purposes, with sizable tonnages for building and the balance (all hydrated) for agricultural use. The output of lime was entirely from Berkshire County.

**TABLE 2.—Lime (quick and hydrated) sold by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Total | Average per ton |
| 1947–51 (average) | 123,259 | $1,540,024 | $12.49 | 1954 | 127,836 | $1,709,341 | $13.37 |
| 1952 | 132,135 | 1,999,545 | 15.13 | 1955 | 134,952 | 1,957,346 | 14.50 |
| 1953 | 135,383 | 2,156,205 | 15.93 | 1956 | 134,248 | 2,093,195 | 15.59 |

**Perlite.**—Perlite was expanded by the Permalite Division, Whittemore Co., at Roslindale, Suffolk County. Crude material was obtained from Colorado and New Mexico. The expanded product averaged 8 pounds to the cubic foot and was consumed mostly as plaster aggregate (71 percent of sales) and concrete aggregate (26 percent of sales). Demand was less in 1956 than in 1955, due to changing market requirements.

**Roofing Granules.**—Bird & Son, East Walpole, Norfolk County, prepared and marketed slate-roofing granules.

**Sand and Gravel.**—Production of sand and gravel in 1956 rose 6 percent in tonnage and 7 percent in value. The active road-building program was reflected in the 27-percent increase of sand and gravel used for paving purposes in 1956 compared with 1955. Structural sand and gravel remained the principal type, but in 1956 it composed only 46 percent of the total sand and gravel produced, compared with 57 percent of the total in 1955. Molding sand, fire or furnace sand, railroad-ballast gravel, and ground sand were included among the other varieties of sand and gravel sold or used in Massachusetts in 1956. Although the tonnage of Government-and-contractor sand and gravel in 1956 rose nearly one-fifth (19

[2] Rock Products, vol. 59, No. 1, January 1956, p. 63; No. 6, June 1956, p. 53.

Digitized by Google

**TABLE 3.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Structural | 2,875,484 | $2,508,822 | $0.87 | 2,427,389 | $2,415,922 | $1.00 |
| Paving | 1,358,366 | 1,074,808 | .79 | 1,582,281 | 1,288,516 | .81 |
| Filter | (1) | (1) | (1) | 8,000 | 10,000 | 1.25 |
| Other | (1) | (1) | (1) | 301,042 | 259,108 | .86 |
| Gravel: | | | | | | |
| Structural | 2,433,690 | 2,870,499 | 1.18 | 2,274,967 | 2,890,757 | 1.27 |
| Paving | 1,643,426 | 1,168,074 | .71 | 2,016,390 | 1,434,671 | .71 |
| Railroad ballast | 15,025 | 5,259 | .35 | 13,878 | 5,138 | .37 |
| Other | 491,372 | 359,696 | .73 | 804,429 | 575,198 | .72 |
| Undistributed [2] | 257,396 | 420,812 | 1.63 | 158,414 | 350,073 | 2.21 |
| Total commercial sand and gravel | 9,074,759 | 8,407,970 | .93 | 9,586,790 | 9,229,383 | .96 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Structural | 43,565 | 100,157 | 2.30 | 581 | 215 | .37 |
| Paving | 71,735 | 130,461 | 1.82 | 85,284 | 55,000 | .64 |
| Gravel: | | | | | | |
| Structural | 152,594 | 124,819 | .82 | | | |
| Paving | 238,290 | 162,922 | .68 | 516,770 | 235,233 | .46 |
| Total Government-and-contractor sand and gravel | 506,184 | 518,359 | 1.02 | 602,635 | 290,448 | .48 |
| Grand total | 9,580,943 | 8,926,329 | .93 | 10,189,425 | 9,519,831 | .93 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes molding sand, fire or furnace sand (1956), engine sand (1955), ground sand, and uses indicated by footnote 1.

percent), commercial operations in 1956 totaled 94 percent of all sand and gravel sold or used in the State. The average value of commercial sand and gravel shipments rose slightly in 1956, while that of all sand and gravel remained at the same level as in 1955.

The largest producing counties in 1956, in order of tonnage, were Middlesex, Worcester, Bristol, Essex, and Hampden. These five counties supplied two-thirds of the total output in Massachusetts. The larger producers included: Worcester Sand & Gravel Co., Inc., Worcester County; Boston Sand & Gravel Co., Norfolk and Plymouth Counties; J. J. Cronin Co. and Thomas Quinn Co., Middlesex County; Yemma Bros., Inc., Essex County; Berkshire Gravel, Inc., Berkshire County; and E. A. Jenson & Sons, Inc., Hampden County.

**Stone.**—Stone produced in Massachusetts in 1956 reached a new high, totaling 5.4 million short tons valued at $13.8 million—an increase of 32 percent in quantity and 21 percent in value over 1955. Dimension and crushed or broken stone was produced, all from quarry operations. Of the dimension stone, granite composed 92 percent of the quantity and 97 percent of the value; basalt and sandstone made up the balance. The production of dimension stone in 1956 rose 13 percent in quantity and 2 percent in value compared with 1955 and represented 3 percent of the tonnage and 36 percent of the



Digitized by Google

value of Massachusetts stone. Curbing and flagging, the largest dimension-stone uses, totaled 54 percent of the tonnage and 45 percent of the value of all dimension. Dressed construction stone, the next largest use, accounted for 18 percent of the quantity and 26 percent of the value of dimension stone. Other types of dimension stone showing large increases in both tonnage and value over 1955 were rubble and rough architectural stone.

Production of crushed and broken stone again increased substantially, rising 32 percent in tonnage and 35 percent in value in 1956 compared with 1955. Large increases over 1955 in railroad ballast, agricultural limestone, and concrete aggregate and roadstone were indicated, although stone used for riprap declined in 1956. Crushed stone used for concrete and roadstone totaled nearly 4.5 million short tons valued at $6.9 million—a rise of 35 percent in tonnage and 41 percent in value. In 1956, 64 percent of the tonnage of crushed and broken stone marketed was basalt, and 20 percent was granite. Other types of crushed and broken stone produced in Massachusetts in 1956 were limestone and miscellaneous stone (granitic gneiss).

Twenty-eight firms or individuals operated 33 commercial stone quarries in Massachusetts in 1956. Basalt was produced at 12 quarries, granite at 14, limestone at 5, and sandstone and miscellaneous stone at 1 each (1 operator quarried both basalt and limestone). The chief centers for dimension-stone production were Middlesex and Worcester Counties and for crushed and broken stone Berkshire, Essex, Hampden, Norfolk, and Suffolk Counties.

**TABLE 4.—Stone sold or used by producers, 1955–56, by uses**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Quantity | Value | Quantity | Value |
| Dimension stone: | | | | |
| Building stone: | | | | |
| Rough construction, short tons | 10,238 | $174,614 | 8,167 | $220,751 |
| Rubble, do | 6,415 | 11,647 | 18,534 | 27,742 |
| Dressed construction, do | 22,240 | 1,157,918 | 24,821 | 1,290,598 |
| Rough architectural, do | 1,035 | 32,678 | 4,769 | 174,372 |
| Dressed architectural, do | (1) | (1) | 5,002 | 615,621 |
| Rough monumental, do | (1) | (1) | (1) | (1) |
| Dressed monumental, do | (1) | (1) | (1) | (1) |
| Durax and paving blocks, do | (1) | (1) | 1,073 | 25,594 |
| Curbing and flagging, do | 76,417 | 2,541,561 | 73,505 | 2,257,243 |
| Undistributed [2] | 5,590 | 966,570 | 1,461 | 358,127 |
| Total dimension stone (quantities approximate, in short tons) | 121,935 | 4,884,988 | 137,332 | 4,970,048 |
| Crushed and broken stone: | | | | |
| Riprap, short tons | 122,438 | 199,463 | 70,922 | 119,265 |
| Concrete aggregate and roadstone, do | 3,336,645 | 4,867,622 | 4,490,731 | 6,871,430 |
| Railroad ballast, do | (3) | (3) | 111,814 | 144,813 |
| Agricultural (limestone), do | (3) | (3) | 114,147 | 430,106 |
| Other uses, do | 141,569 | 754,852 | 516,932 | 1,217,258 |
| Undistributed [4], do | 405,417 | 674,239 | | |
| Total crushed and broken stone, do | 4,006,069 | 6,496,176 | 5,304,546 | 8,782,872 |
| Grand total (quantities approximate, in short tons) | 4,128,004 | 11,381,164 | 5,441,878 | 13,752,920 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes items indicated by footnote 1.
[3] Included with "Undistributed."
[4] Includes furnace flux, limestone for lime, and items indicated by footnote 3.

Digitized by Google

**Vermiculite.**—Exfoliated vermiculite was produced by two companies in Middlesex County. Uses included plaster and concrete aggregate and house insulation. Both domestic and foreign vermiculite was exfoliated. Production in 1956 increased about one-third over 1955.

### MINERAL FUELS

**Peat.**—Output of peat in Massachusetts in 1956 was confined to Essex County, near Lawrence. This product was consumed locally as a soil conditioner.

## REVIEW BY COUNTIES

**Barnstable.**—Concrete Products Co. and Frederick V. Lawrence, Inc., both of Falmouth, produced building sand and gravel and paving sand and gravel, respectively. Dennis E. Dugan, Jr., John F. Noons, and Tri-City Concrete Co. (locations unknown) mined paving sand. Whitehead Bros. Co. produced molding sand from a pit at Provincetown. The Massachusetts Department of Public Works mined a small tonnage of paving sand and gravel for road construction. Granite for use as riprap for jetty construction in beach-improvement programs was produced by Turner & Breivogel, Inc., near Falmouth. The Massachusetts Department of Public Works quarried miscellaneous stone and used it in crushed or broken form as riprap and concrete aggregate and roadstone.

**Berkshire.**—Lee Lime Corp. (Lee), New England Lime Co. (Adams), and United States Gypsum Co. (Farnams) all burned limestone produced at their own quarries in Berkshire County. Both quick and hydrated lime was produced, chiefly for chemical and industrial consumption, such as metallurgical use, paper, paint, and dye manufacture, and many other applications. Shipments of lime were made largely to New England States, New Jersey, and New York. In addition to use in making lime, limestone was quarried by these three firms for riprap, blast-furnace flux, agricultural stone, whiting, asphalt, fertilizer and rubber filler, and for other purposes.

**TABLE 5.—Value of mineral production in Massachusetts, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Barnstable | $261,289 | $193,296 | Sand and gravel, stone. |
| Berkshire | 3,080,863 | 3,951,069 | Lime, stone, sand and gravel. |
| Bristol | 1,393,924 | 1,514,527 | Sand and gravel, stone, clays. |
| Dukes | (1) | 21,197 | Sand and gravel, stone. |
| Essex | 1,499,512 | 2,410,110 | Stone, sand and gravel, peat. |
| Franklin | (1) | 188,927 | Stone, sand and gravel. |
| Hampden | (1) | (1) | Stone, sand and gravel, clays. |
| Hampshire | (1) | (1) | Sand and gravel, stone. |
| Middlesex | 6,782,365 | 7,245,141 | Stone, sand and gravel, clays. |
| Nantucket | | 463 | Sand and gravel. |
| Norfolk | 2,489,849 | 2,040,721 | Sand and gravel, stone. |
| Plymouth | 707,302 | 987,336 | Sand and gravel, stone, clays. |
| Suffolk | 1,401,839 | 1,200,307 | Stone, sand and gravel. |
| Worcester | 1,602,916 | 1,819,831 | Sand and gravel, stone. |
| Undistributed [2] | 2,889,593 | 3,512,394 | |
| Total | 22,109,000 | 25,085,000 | |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes values indicated by footnote 1.

Digitized by Google

The New England Lime Co., Adams, has installed multiple cyclone dust collectors on 2 of its largest rotary kilns in the latest phase of a 4-year plan to reduce dust at the plant.[3] A detailed, illustrated description of a commercial-size fluidizing calciner or reactor installed by the same firm for preparing burned lime was published.[4] This process is an adaptation to lime manufacture of methods developed to obtain improved petroleum products during World War II. The operation proved so advantageous that a second fluidizing unit, with an estimated daily capacity of 100 tons of lime, was installed, full operation to begin in the early part of 1957.[5]

Structural and paving sand and gravel were mined in Berkshire County by 11 commercial producers and paving sand and gravel only by 2 Government-and-contractor agencies. Producers were Abby & Sons and Bernard Miner, Lee; Berkshire Gravel, Inc., with mines at Lee and Pittsfield; Frank Bushika, with pit at Cheshire; General Sand and Stone Corp., Dalton; Hutchinson Sand & Gravel Co., with pits at Dalton and Pittsfield; Maxymillian, Inc., with sand pit at North Adams; Mountain Sand & Gravel Co., Inc., Great Barrington; Mary Sekaske, with gravel bank at Becket; and Twentieth Century Concrete Works, Inc., Stockbridge. Sand and gravel for road and street paving was mined by the City of North Adams Highway Department, and paving gravel was produced by contractors for Massachusetts Department of Public Works. Pettinos New England, Inc., marketed ground sand prepared from quartz deposits near Cheshire. This product was consumed for foundry use, in soap and scouring preparations, and for other purposes.

The Otis Chester Granite Co., Inc., produced dimension blue granite for monumental stone from its quarry at Otis, mostly for local use in 1956. John S. Lane & Son, Inc., produced crushed limestone for concrete aggregate and roadstone at a quarry near West Stockbridge. No peat was reported from Berkshire County in 1956.

**Bristol.**—Stiles & Hart Brick Co. mined common clay at Taunton for use in manufacturing heavy clay products. The Blue Stone Division, Warren Bros. Roads Co., quarried riprap and roadstone from its granite quarry near Acushnet.

Bristol ranked third among Massachusetts counties in both the quantity and value of sand and gravel produced in the State. The 10 leading producers were: Joseph Borge & Sons, Inc., and Swansea Sand & Gravel Co., Swansea; Brockton Sand & Gravel Co., South Easton; Chiccine Sand Pit, operated by Dorothy C. Brooks, Dartmouth; McCabe Sand & Gravel Co., Taunton; Morse Sand & Gravel Co., Attleboro; Pine Hill Sand & Gravel Co., Westport; River Sand & Gravel Co., Seekonk; J. J. Stevens Co., Dartmouth; and Thomas Bros. Corp., Raynham (operated under lease to Tri-City Concrete Co., Inc.). Sand and gravel also was mined by three other operators in the county in 1956. Due to the continued building program the demand for sand and gravel in this area was good, although wages were increasing and the competition keen, according to the producers. A

[3] Rock Products, vol. 59, No. 1, January 1956, p. 63.
[4] Herod, Buren C., New England Lime Co. Obtains Efficient Results With Fluidizing Calcines: Pit and Quarry, vol. 48, No. 11, May 1956, pp. 122–124, 146.
[5] Pit and Quarry, Second Fluidizing Unit Producing Chemical Lime for New England Lime Company: Vol. 49, No. 5, November 1956, p. 53

Digitized by Google

diminishing supply of bank gravel affected adversely one or two operators. Paving gravel also was produced for local street construction by the City of Taunton Street Department and paving sand and gravel by the Town of Dartmouth Highway Department.

**Dukes.**—Colby Construction produced building and paving sand and building gravel at Oak Bluffs. Black Top Construction Co., Oak Bluffs, and Goodale Construction Co., locations unknown, produced paving and road sand. The Massachusetts Department of Public Works mined sand and gravel with its crews in Dukes County and contracted for the production of some paving gravel. That agency also produced some stone for riprap in 1956.

**Essex.**—Peat humus was recovered from bogs near Lawrence by Massachusetts Peat Humus Co. It was used locally as a soil-improvement medium.

Sand and gravel was produced in Essex County in 1956 by 20 commercial operators and 3 Government-and-contractor agencies. The more important of these producers were: Essex Sand & Gravel Co., Ballardvale, near Andover; Georgetown Sand & Gravel Co., Salem; Miles River Sand & Gravel, Inc., Ipswich; Harris D. Shea Co., Rowley; Topsfield Sand & Gravel Co., Topsfield; Videtta Construction Co., Peabody; Wright Contracting Co., Danvers; and Yemma Bros., Inc., Groveland. The demand for sand and gravel in the county was good, in spite of slightly higher prices and wages. The product was used largely as building sand and gravel, with smaller quantities for paving purposes and for fill. The City of Lawrence and Town of Amesbury produced paving sand and gravel. Sand and gravel was produced under contract for the Massachusetts Department of Public Works for paving and street construction, with a small quantity for use for structural purposes.

Dimension granite for use in rough construction and as rubble was quarried by Karl A. Perrson at Rockport from Johnson's Quarry. The Massachusetts Department of Public Works mined granite dimension stone (rough blocks for roads and bridges) and granite for concrete and roadstone in Essex County in 1956. Basalt was quarried for concrete aggregate and roadstone by Essex Sand & Gravel Co., West Peabody; Trimount Bituminous Products Co., Saugus; and Lynn Sand & Stone Co., Swampscott (which also sold basalt for use as riprap, railroad ballast, mineral filler, and other unspecified purposes). Demand for basalt products was good, particularly for use in housing construction. Wages were higher; but prices remained steady, and increased efficiency held earnings at a favorable rate.

**Franklin.**—Structural sand was produced by Mackin Sand & Concrete Products Co. at Greenfield, and the Boston & Maine Railroad mined gravel at Mount Herman for building purposes, for railroad ballast, and for roadway maintenance. Greenfield Massachusetts Broken Stone Co. quarried basalt at Deerfield for riprap, concrete aggregate and roadstone, and railroad ballast. This firm also produced some rubble dimension stone for building purposes.

**Hampden.**—The Westfield Clay Products Co. and Hampshire Brick Co. mined miscellaneous clay at Westfield and Chicopee, respectively, and utilized it in making brick.

Production of sand and gravel in 1956 in Hampden County was made by 10 commercial operators and 1 Government-and-contractor

Digitized by Google

agency. The leading producers were: Banas Sand & Gravel Co., Inc., and D. D. Ruxton Co., Ludlow; Baxter Sand & Gravel Co. and North Wilbraham Sand & Gravel Co., Inc., Springfield; E. A. Jenson & Sons, Inc., Granville Center; John Lizak Palmer; Monson Sand & Gravel Corp., Monson (formerly Edward N. Christianson Sand Co.); and Western Massachusetts Sand & Gravel, Inc., Westfield. Structural and paving sand and gravel were the chief products, with small tonnages of fire or furnace sand and miscellaneous sands. Nearly two-thirds of the total tonnage was washed or otherwise prepared before sale. Paving gravel was mined for road construction under contract with the Massachusetts Department of Public Works.

Basalt for concrete aggregate and roadstone was produced at 2 of the 3 quarries near Southwick owned by John S. Lane & Son, Inc. The third quarry was idle in 1956. McCormick Longmeadow Stone Co., Inc., quarried dimension sandstone at East Longmeadow. Marketed as dressed architectural stone, sales included exterior stone for seven dormitories at Wesleyan University, Middletown, Conn., and for St. Peter and St. Paul's Cathedral, Philadelphia, Pa.

**Hampshire.**—Sand and gravel for structural and paving use was produced in Hampshire County in 1956 by A. Giard & Sons, Inc., Ware; Hampshire Sand & Gravel, Inc., Westhampton; Omasta Bros. and Bill Willard, Inc., Northampton; and Eli Queeneville, South Hadley. Donovan Bros., Inc., Huntington, purchased the Strickland pit in December 1956 and plans to begin operation in the spring of 1957. John S. Lane & Son, Inc., quarried basalt near Amherst for use as concrete aggregate and roadstone.

**Middlesex.**—A. D. Hews & Co., Inc., produced miscellaneous clay near Cambridge for use in making flowerpots. Two firms—Zonolite Co. at North Billerica and California Stucco Products Co. at Cambridge—exfoliated vermiculite. This product was sold principally for use as plaster and concrete aggregate and as home insulation. The crude material came partly from South Africa and the balance from deposits in Montana and South Carolina.

Middlesex. County in 1956 ranked first among Massachusetts counties in order of production of sand and gravel. Increased prices and wages were general in the county, although demand remained active. Depletion and restrictive zoning laws, however, were restricting the supplies of new material, according to some producers. The output of sand and gravel from 21 commerical operations was reported in 1956. Structural and paving sand and gravel comprised by far the bulk of the output. Some molding sand and railroad-ballast gravel were produced, as well as a sizable tonnage of both sand and gravel for which no end use was specified. The leading producers were: Acme Sand & Gravel Co., and Akeson Sand & Gravel Co., both with mines at Woburn; Ashland Sand & Gravel Co., Inc., Ashland; Assabet Sand & Gravel Co., Inc., and Lexington Sand & Gravel Co., South Acton; J. J. Cronin Co., Wilmington; Thomas Quinn Co., Burlington; Riverside Sand & Gravel Co., Newton; and San-Vel Contracting Co., Littleton. The City of Everett mined paving sand and gravel under contract for its own use.

Dimension granite was produced at Westford by H. E. Fletcher Co. and Morris Bros. Granite Co., Inc. The chief products of the H.

Digitized by Google

E. Fletcher Co. were dressed stone for construction work and curbing. This firm also marketed rough construction stone, rubble, and architectural stone and dressed granite for architectural work, paving and monumental blocks. Curbing, rubble, and paving blocks were produced for sale by Morris Bros. Granite Co., Inc.

H. E. Fletcher Co., in addition to dimension stone, produced crushed or broken granite for riprap, roadstone, and other uses. The company granite quarry at Westford covered about 40 acres and was about 200 feet deep. Wire saws were used to make nearly all the subdivision of rock in the quarry. Gangs of 3 or 4 wire saws were used, as well as pairs and singles. Each wire was 16,000 feet long and consisted of a twisted ribbon of high-carbon steel. A smooth, uniform cut was made with the aid of aluminum oxide powder and water. Careful spacing of the wires considerably reduced subsequent millwork. Wire saws also were used in the mill.

The B. & M. Crushed Stone Co., Ashland, quarried granite for road construction. Basalt was quarried at Winchester by Winchester Crushed Stone Co. for use in concrete and as roadstone. A small quantity of rough dimension stone for building use was also produced. Granitic gneiss was quarried by John P. Condon Corp. at Dracut for concrete aggregate and roadstone.

**Nantucket.**—Nantucket Construction Co. produced paving sand, and the Massachusetts Department of Public Works mined paving sand and gravel with its own crews for road and street maintenance on the island.

**Norfolk.**—Structural and paving sand and gravel, and a small tonnage of filter sand and miscellaneous gravel were mined in Norfolk County in 1956. The chief producers reporting output were: Boston Sand & Gravel Co. and A. A. Will Sand & Gravel Corp., Canton; Edward T. Dwyer Sand & Gravel Corp., Braintree; Glacier Sand & Stone Co., Inc., Norwood; and Varney Bros. Sand & Gravel Corp., Milford. Other smaller producers were: Charles E. Wilkinson Estate, Wrentham; Frank W. Weaver, East Weymouth; and Ray Sand & Gravel Co., Canton. The Town of Needham Highway Department also mined paving and road sand for its own use.

J. E. Swingle, Inc., quarried dimension granite for monuments. Bates Bros. Seam Face Granite Co. produced rough dimension stone for both construction and architectural purposes. Granite for concrete and roadstone and railroad ballast and for sale as stone dust was quarried and prepared by Old Colony Crushed Stone Co. All of the above granite producers operated quarries near Quincy. Stoughton Crushed Stone Co. quarried basalt at Stoughton for concrete aggregate and roadstone. The demand for basalt products was higher, in spite of increased prices, due to rising cost of repairs and higher wages. Roofing granules were sold by Bird & Son, East Walpole.

**Plymouth.**—Clay was mined from open pits by Bridgewater Brick Co. at East Bridgewater and Stiles & Hart Brick Co. at South Bridgewater and manufactured into building brick and other heavy clay products. Sand and gravel in Plymouth County in 1956 was produced by 16 operators. Of these, the more important were: Boston Sand & Gravel Co., Greenbush; A. S. Cedergren, West Bridgewater; Marshfield Sand & Gravel Co., Marshfield; Petrino Co., Whitman; Bradford

Digitized by Google

Weston, Inc., Hingham; and Whitehead Brothers Co., Onset and Marion (dredge). Building, paving, molding, filter, and other sands and building and paving gravel were produced. The Massachusetts Department of Public Works produced paving sand and gravel with its own crews and also contracted for the mining of sizable tonnages of road sand and gravel.

Granite for riprap and for road construction was quarried by Bradford Weston, Inc., at Hingham. Stone for riprap and concrete aggregate and roadstone was quarried by the Massachusetts Department of Public Works.

**Suffolk.**—Expanded perlite was produced for sale by the Permalite Division, Whittemore Co., at Roslindale, largely as concrete and plaster aggregate. Crude perlite was shipped from Western States. D. B. Raymond, Burlington, produced gravel fill. Sand and gravel was produced under contract for the Massachusetts Department of Public Works for road and street construction. Granite was quarried and crushed by West Roxbury Crushed Stone Co., West Roxbury, for concrete and roadstone. Crushed limestone for concrete and roadstone and rough dimension block for roads and bridges were produced for its own use by the Massachusetts Department of Public Works. Crushed and broken basalt for concrete aggregate and roadstone for riprap were produced by Rowe Contracting Co., Malden, with quarry in Suffolk County, and William J. Barry Co., Roslindale. The latter firm also prepared roofing granules.

**Worcester.**—Worcester County in 1956 ranked second in both quantity and value of sand and gravel produced. Sand and gravel for paving and building use had the largest markets, with a small quantity for molding sand and the rest for miscellaneous or unspecified uses. Output was reported from 33 operations, the largest of which were: Allaire Brothers, Auburn; B. N. T. Sand & Gravel Co., Inc., and De Falco Concrete, Inc., Millbury; R. T. Curtis, Inc., Barre; E. L. Dauphinais, Inc., Grafton; P. J. Keating, Inc., Lunenberg; Joseph Rosenfeld, Hopedale; Henry Trulson, Holden; Webster-Dudley Sand & Gravel, Inc., Webster; and Worcester Sand & Gravel Co., Shrewsbury. One producer reported an increase in industrial and Government work but less private housing. Business in general was reported to be good. One operator (De Falco) erected a new plant, which affected the volume of his business temporarily.

Granite building stone was quarried by H. E. Fletcher Co., Milford; and Uxbridge Granite Co., Uxbridge. Output consisted of both rough and dressed construction and architectural stone. Holden Trap Rock Co. (Holden) quarried basalt for use as concrete aggregate and roadstone.

Digitized by Google

# The Mineral Industry of Michigan

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Michigan Department of Conservation, Geological Survey Division, State of Michigan.

By Donald F. Klyce [1]

EXPLOITATION of lower grade mineral deposits, made possible by the application of improved mineral extraction techniques, had a marked effect on Michigan mineral production in 1956. In Marquette County iron ore was produced from the jasper iron formation in commercial quantities for the first time. Production of copper from the sulfide ores of Ontonagon County composed a major portion of the State total. Application of metallurgical techniques to sand and gravel processing is yielding a high-quality product that meets the rigid specifications of modern usage. Sand and gravel producers report good results in using a dense-medium process for separating lighter weight unwanted materials from their commodity at low cost to produce a premium product.

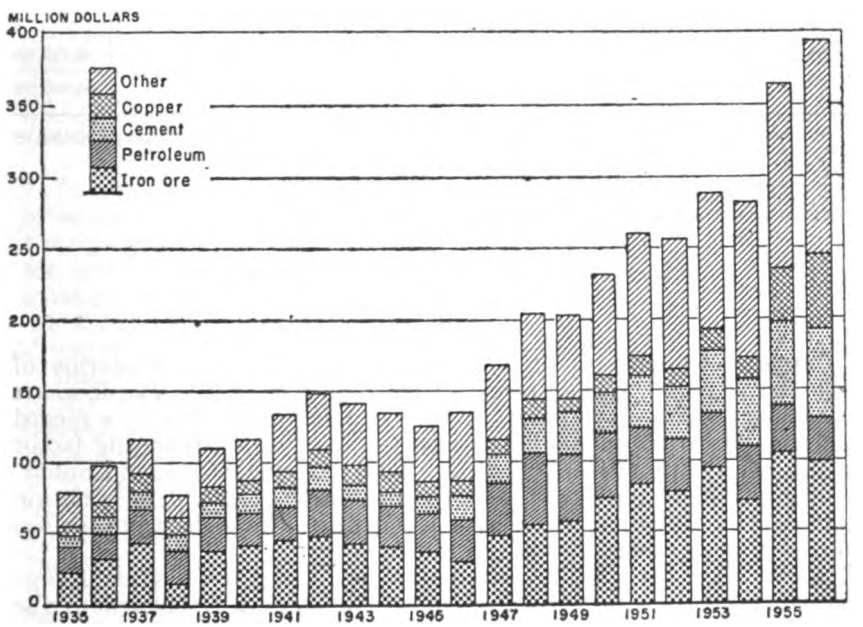



FIGURE 1.—Value of iron ore, petroleum, cement, copper, and total value of all minerals in Michigan, 1935–56.

[1] Commodity-industry analyst, Minneapolis Field Office, Division of Mineral Industries, Region V, Bureau of Mines, Minneapolis, Minn.



Digitized by Google

In 1956 Michigan mineral production was valued at $395 million—an increase of 8.5 percent over the 1955 record high of $364 million. Michigan led the Nation in the production of gypsum, marl, and salt and ranked second in output of iron ore, sand and gravel, and stone.

In order of value the leading minerals produced were: Iron ore, cement, copper, salt, sand and gravel, stone, and petroleum.

**TABLE 1.—Mineral production in Michigan, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Cement: | | | | |
| Portland.....376-pound barrels | 18,128,068 | $52,352,794 | 20,236,933 | $61,749,391 |
| Masonry.....do | 1,610,332 | 5,695,606 | 1,643,289 | 6,048,871 |
| Clays | 1,937,593 | 2,019,077 | 2,110,030 | 2,401,051 |
| Copper (recoverable content of ores, etc.) | 50,066 | 37,349,236 | 61,526 | 52,297,100 |
| Gem stones | (2) | 250 | (2) | 500 |
| Gypsum | 1,762,105 | 5,660,587 | 1,715,832 | 5,861,152 |
| Iron ore (usable).....long tons, gross weight | 14,143,509 | 104,258,188 | 12,536,009 | 98,110,779 |
| Magnesium compounds | 46,336 | 5,063,621 | (3) | (3) |
| Marl, calcareous | 119,313 | 57,176 | 157,246 | 94,821 |
| Natural gas.....million cubic feet | 8,300 | 955,000 | 10,911 | 1,451,000 |
| Peat | 29,743 | (3) | 31,111 | 474,899 |
| Petroleum (crude).....thousand 42-gallon barrels | 11,266 | 32,900,000 | 10,740 | 30,824,000 |
| Salt (common) | 4,975,442 | 31,668,351 | 5,548,178 | 35,643,860 |
| Sand and gravel [4] | 37,214,459 | 29,490,775 | 42,149,946 | 35,145,953 |
| Silver (recoverable content of ores, etc.).....troy ounces | 478,000 | 432,614 | 379,990 | 343,910 |
| Stone | 33,635,612 | 28,908,784 | 33,998,830 | 31,010,175 |
| Value of items that cannot be disclosed: Bromine, calcium chloride and calcium-magnesium chloride, lime, magnesium chloride (1955), natural-gas liquids, potassium salts, and value indicated by footnote 3 | ..... | 31,849,463 | ..... | 38,716,531 |
| Total Michigan [5] | ..... | 363,787,000 | ..... | 394,536,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Includes friable sandstone.
[5] Total has been adjusted to eliminate duplicating value of clays and stone.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Copper.**—Copper production in Michigan in 1956, in terms of recoverable metal, was 23 percent higher than in 1955. The increase was due in part to the price level for copper, which was at a record high for the first 6 months of the year. Another contributing factor was full-scale operation of the White Pine mine in Ontonagon County.

Calumet & Hecla, Inc., operated its mines, mill, and reclamation plant in Houghton and Keweenaw Counties. The highest production in recent years was reported by the company.

The Quincy Mining Co. reclamation plant and the Copper Range Co. Champion mine and concentrator were operated throughout the year.

Production for the State in 1956 totaled 61,526 short tons, valued at $52.3 million. Output was from 12 underground mines and 3 tailing-reclamation plants.

Digitized by Google

Two contracts between the Defense Minerals Exploration Administration (DMEA) and Calumet & Hecla, Inc., were in effect during 1956. One contract, covering copper-exploration activities in Houghton and Keweenaw Counties, was terminated in August. A second contract for exploration work in Ontonagon County continued through the year.

**TABLE 2.—Mine production of copper in 1956, by months, in terms of recoverable metal**

| Month | Short tons | Month | Short tons |
|---|---|---|---|
| January | 5,070 | August | 5,140 |
| February | 5,130 | September | 4,770 |
| March | 5,610 | October | 4,951 |
| April | 5,250 | November | 4,945 |
| May | 5,350 | December | 5,150 |
| June | 5,200 | | |
| July | 4,960 | Total | 61,526 |

**TABLE 3.—Mine production of copper, 1947–51 (average) and 1952–56, in terms of recoverable metal**

| Year | Mines producing | | Material treated | | Copper | |
|---|---|---|---|---|---|---|
| | Lode | Tailing | Ore (short tons) | Tailing (short tons) | Short tons | Value |
| 1947–51 (average) | 10 | 3 | 1,998,803 | 2,405,334 | 24,411 | $10,528,125 |
| 1952 | 8 | 3 | 1,879,131 | 1,991,051 | 21,699 | 10,502,316 |
| 1953 | 9 | 2 | 2,314,420 | 1,878,297 | 24,097 | 13,831,678 |
| 1954 | 13 | 2 | 2,478,085 | 1,812,695 | 23,593 | 13,919,870 |
| 1955 | 11 | 2 | 5,319,699 | 1,488,854 | 50,066 | 37,349,236 |
| 1956 | 12 | 3 | 6,427,095 | 2,233,599 | 61,526 | 52,297,100 |

The average annual weighted price used to calculate the value of copper produced in 1956 was 42.5 cents per pound. In 1955 the average price used was 37.3 cents per pound. Quoted market prices for copper per pound, delivered Connecticut Valley, opened 1956 at 44 cents, increased to a high of 48 cents March 13, declined to 39.5 cents July 10, remained about 40 cents until October 25 when it dropped to 36.7 cents, and closed 1956 at 36 cents.

**Iron Ore.**—Shipments of usable iron ore in 1956 were 89 percent of the 1955 total, while the tonnage of crude iron ore mined in 1956 increased 8 percent over 1955. The value at the mine of the usable ore shipped in 1956 was $98 million compared with a 1955 value of $104 million. The average mine value of the ore, without respect to grade, was $7.83 per long ton in 1956 and $7.37 in 1955. The value applies more closely to the non-Bessemer grades, which constituted the bulk of the tonnage shipped. Dates of first and last lake shipments of ore in 1956 from Michigan and Wisconsin ports were: Ashland-Soo, April 23–November 25; Ashland-C&NW, April 25–November 28; Escanaba-C&NW, April 7–December 3; Marquette-DSSA, April 26–November 11; Marquette-LS&S, April 9–December 5; Superior-GN, April 5–December 8; and Superior-NP-Soo, April 8–November 25.

Digitized by Google

**TABLE 4.—Production, shipments, and stocks of crude iron ore in 1956, by counties and ranges, in long tons [1]**

| County and range | Stocks of crude ore, Jan. 1 1956 | Production in 1956 | | Shipments in 1956 | | Stocks of crude ore, Dec. 31, 1956 |
|---|---|---|---|---|---|---|
| | | Underground | Open pit | Direct to consumers | To beneficiation plants | |
| County: | | | | | | |
| Baraga | | | 225,999 | | 225,999 | |
| Dickinson | | | 130,456 | 106,647 | | 23,809 |
| Gogebic | 389,046 | 2,671,892 | 237,794 | 2,937,174 | | 361,558 |
| Iron | 430,207 | 3,875,498 | 446,971 | 3,668,959 | 296,656 | 787,061 |
| Marquette | [2] 814,984 | 5,168,953 | 1,228,388 | 5,318,832 | 913,229 | 980,264 |
| Total | [2] 1,634,237 | 11,716,343 | 2,269,608 | 12,031,612 | 1,435,884 | 2,152,692 |
| Range: | | | | | | |
| Gogebic | 389,046 | 2,671,892 | 237,794 | 2,937,174 | | 361,558 |
| Marquette | [2] 814,984 | 5,168,953 | 1,454,387 | 5,318,832 | 1,139,228 | 980,264 |
| Menominee | 430,207 | 3,875,498 | 577,427 | 3,775,606 | 296,656 | 810,870 |
| Total | [2] 1,634,237 | 11,716,343 | 2,269,608 | 12,031,612 | 1,435,884 | 2,152,692 |

[1] Exclusive of iron ore containing 5 percent or more manganese.
[2] Revised.

**TABLE 5.—Usable iron ore shipped from mines, 1947–51 (average) and 1952–56, by ranges, in long tons [1]**

| Year | Marquette range | Menominee range (Michigan portion) | Gogebic range (Michigan portion) | Total |
|---|---|---|---|---|
| 1947–51 (average) | 5,059,136 | 4,037,429 | 3,561,068 | 12,657,633 |
| 1952 | 4,516,509 | 4,258,996 | 3,003,861 | 11,779,366 |
| 1953 | 5,571,501 | 4,552,915 | 3,188,350 | 13,312,766 |
| 1954 | 3,675,429 | 3,655,995 | 2,377,743 | 9,709,167 |
| 1955 | 6,639,992 | 4,325,786 | 3,177,731 | 14,143,509 |
| 1956 | 5,688,720 | 3,889,213 | 2,958,076 | 12,536,009 |

[1] Exclusive of iron ore containing 5 percent or more manganese, natural.

**TABLE 6.—Usable iron ore produced, 1947–51 (average), 1952–56, and total 1854–1956, by ranges, in long tons [1]**

| Year | Marquette range | Menominee range (Michigan portion) | Gogebic range (Michigan portion) | Total |
|---|---|---|---|---|
| 1947–51 (average) | 4,999,428 | 4,085,734 | 3,569,553 | 12,654,715 |
| 1952 | 4,668,550 | 4,168,465 | 2,972,930 | 11,809,945 |
| 1953 | 5,785,118 | 4,559,638 | 3,468,585 | 13,813,341 |
| 1954 | 4,670,603 | 3,640,320 | 2,439,763 | 10,750,686 |
| 1955 | 5,412,956 | 4,018,298 | 2,879,357 | 12,310,611 |
| 1956 | 5,869,171 | 4,264,407 | 2,909,686 | 13,043,264 |
| Total 1854–1956 | 289,298,229 | [2] 240,884,492 | [2] 236,186,578 | 766,369,299 |

[1] Exclusive of iron ore containing 5 percent or more manganese, natural.
[2] Distribution by ranges partly estimated before 1906.

**Manganese.**—No manganiferous iron ores or ferruginous manganese ores were produced in Michigan during 1956.

**Silver.**—Although most Michigan copper ores contain silver, because of the refining process in general use (fire refining) the silver is seldom

Digitized by Google

recovered. During 1956 a portion of the copper concentrate and copper blister was electrolytically refined, and 379,990 fine ounces of silver valued at $343,910 was recovered.

**TABLE 7.—Manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural) shipped from mines, 1947–51 (average) and 1952–56**

| Year | Long tons | Year | Long tons |
|---|---|---|---|
| 1947–51 (average) | [1] 33,437 | 1954 | 13,715 |
| 1952 | 19,728 | 1955 | ---- |
| 1953 | 68,081 | 1956 | ---- |

[1] No shipments during period 1947–49.

## NONMETALS

**Cement.**—Michigan cement plants shipped 20.2 million barrels of portland cement valued at $61.7 million in 1956—an increase of 12 percent in quantity and of 18 percent in value over 1955. Portland cement was produced in 8 plants—3 in Wayne County and 1 each in Alpena, Bay, Emmet, Lenawee, and St. Clair Counties. Continued strong demand from the construction industry was the prime factor in the increased production of cement. Raw materials used in manufacturing cement (clay, gypsum, slag, and iron sinter) were mined locally or purchased from nearby sources, except limestone, which was shipped principally by water from quarries in the northern part of the State.

The average value of Michigan portland-cement shipments in 1956 was $3.05 per barrel compared with $2.89 in 1955.

Masonry cements, manufactured from portland cement or cement clinker and other materials, were produced at five plants. Shipments totaled 1.6 million barrels valued at $6 million in 1956. The average value of masonry cements was $3.68 per barrel in 1956 and $3.54 in 1955.

**TABLE 8.—Finished portland cement produced, shipped and in stock, 1947–51 (average) and 1952–56**

| Year | Active plants | Production (barrels) | Shipments from mills | | | Stocks at mills on Dec. 31 (barrels) |
|---|---|---|---|---|---|---|
| | | | Barrels | Value | | |
| | | | | Total | Average per barrel | |
| 1947–51 (average) | 7 | 12,350,019 | 12,260,506 | $27,193,067 | $2.22 | 1,239,212 |
| 1952 | 7 | 14,790,587 | 14,760,783 | 36,819,042 | 2.49 | 1,627,909 |
| 1953 | 7 | 15,532,853 | 15,853,096 | 41,860,464 | 2.64 | 1,307,666 |
| 1954 | 7 | 16,671,383 | 16,711,710 | 45,691,867 | 2.73 | 1,266,340 |
| 1955 | 7 | 18,204,826 | 18,128,068 | 52,352,794 | 2.89 | [1] 1,525,000 |
| 1956 | 8 | 20,485,159 | 20,236,933 | 61,749,391 | 3.05 | 1,773,055 |

[1] Revised figure.

**Clays.**—Clay producers in Michigan in 1956 mined 2.1 million tons of miscellaneous clay valued at $2.4 million. The output was 9

Digitized by Google

percent greater than in 1955 and the value 19 percent higher. The average value per ton increased from $1.04 in 1955 to $1.14 in 1956. Nearly three-quarters of the clays produced was used in manufacturing cement. The balance was utilized for manufacturing brick, tile, and other heavy clay products, refractories, and light weight aggregates. Sixteen producers reported mining operations in 12 counties. A third of the production was from Wayne County. Production was also reported from Alpena, Bay, St. Clair, Lenawee, Emmet, Shiawassee, Eaton, Monroe, Clinton, Gratiot, and Saginaw Counties.

**Gem Stones.**—A small quantity of semiprecious gem stones—chiefly agates and thomsonite—were collected principally on the beaches of the Keweenaw Peninsula in 1956.

**Gypsum.**—The volume of crude gypsum mined in Michigan in 1956 was about 3 percent less than in 1955. The decrease can be attributed to the lowered demand for building materials that resulted from a decline in home construction. The average price per ton increased 21 cents (from $3.21 to $3.42), and the value of production in 1956 was $5.9 million—$200,000 higher than the 1955 figure. Four companies, two each in Kent and Iosco Counties, reported mining operations. Processing plants were operated at Alabaster, Detroit, Grand Rapids, and National City. The principal products were plaster board, lath, exterior sheathing, and plaster.

**Lime.**—Quick and hydrated lime was produced by 3 companies, 1 each in Bay, Mason, and Menominee Counties. High-calcium limestone quarried in northern Michigan was used. The principal uses for the output were at metallurgical plants and in paper manufacturing and water purification. Smaller quantities were used at sewage-disposal plants and in sugar refining.

**Marl.**—Michigan was the leading producer of calcareous marl in 1956, with a reported production of 157,000 tons. Output was nearly one-third greater than in 1955. The average price per ton increased from 48 cents in 1955 to 60 cents in 1956. The marl was sold chiefly for agricultural use in neutralizing acid soils. Over 80 percent of the production was from Isabella, Kalamazoo, Calhoun, Branch, Allegan, and Mecosta Counties. Production also was reported in eight other counties.

**Natural Salines.**—An important chemical industry has been built on natural brines from Michigan wells. During the year Standard Lime & Cement Co. was doubling the capacity of its chemical plant at Manistee. Pennsylvania Salt Manufacturing Co. was constructing facilities for producing calcium hypochloride at Wyandotte. Products, other than salt (see section on Salt), produced from the brines in 1956 were bromine and bromine compounds, calcium chloride, calcium-magnesium chloride, other magnesium compounds, and potassium salts. Production was reported from wells in Gratiot, Lapeer, Manistee, Mason, and Midland Counties. Output was valued at $37 million in 1956—8 percent higher than in 1955.

**Perlite.**—Crude perlite from Western States was expanded at two plants in Grand Rapids for use as a lightweight aggregate in plaster and concrete.

**Salt.**—Salt was produced from well brines in Gratiot, Manistee, Midland, Muskegon, St. Clair, and Wayne Counties. The product

Digitized by Google

was used for a variety of chemical and industrial purposes. About three-quarters of the total was used in producing chlorine and soda ash and for de-iceing highways.

One underground mine in Wayne County produced rock salt in several sizes and grades. In 1956, 10 companies operated a total of 11 plants. Production in 1956 was about 12 percent greater than in 1955.

**Sand and Gravel.**—Sand and gravel production was reported from 78 of the 83 counties in Michigan. Volume was 13 percent greater than in 1955, and value was up 19 percent. Over 90 percent of the output was used in the building- and road-construction industries. Over 40 percent of the State production was reported from counties in the Detroit area. A trend toward beneficiation of sand and gravel was indicated by the installation of dense medium separation-process plants by Bundy Hill Gravel Co. in Hillsdale County and Killins Gravel Co. in Washtenaw County. At both installations the sand and gravel deposits, glacial in origin, contain a considerable quantity of chert, shale, and sandstone. These materials absorb moisture, expand on freezing, and often result in spalling of concrete unless removed from the aggregate. Many of the best gravel deposits in the State have been depleted, but this process will enable marginal deposits to be worked and maintain a supply of high-grade aggregate.

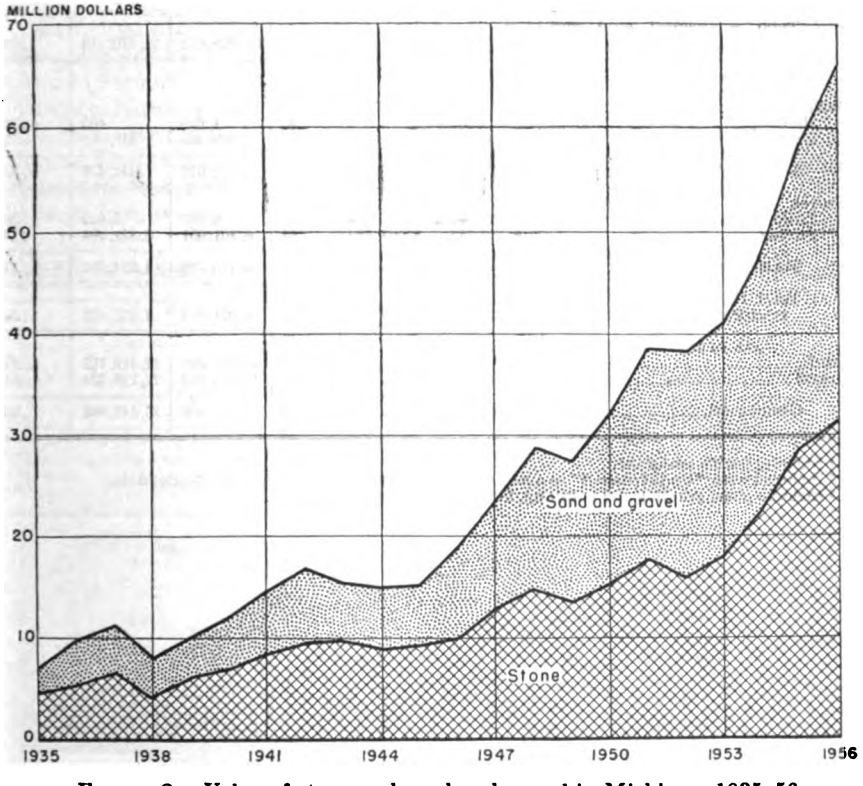



FIGURE 2.—Value of stone and sand and gravel in Michigan, 1935–56.

Digitized by Google

**TABLE 9.—Sand and gravel, sold or used by producers, 1955–56, by classes of operations and uses**

| Class of operation and use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average |
| **COMMERCIAL OPERATIONS** | | | | | | |
| Sand: [1] | | | | | | |
| Glass | 348,610 | $919,403 | $2.64 | (2) | (2) | (2) |
| Molding | 1,895,382 | 1,795,555 | .95 | 1,753,195 | $1,875,766 | $1.07 |
| Building | 5,237,547 | 4,102,520 | .78 | 6,145,545 | 4,710,610 | .77 |
| Paving | 4,599,304 | 3,670,800 | .80 | 5,157,927 | 4,044,540 | .78 |
| Grinding and polishing | 291,472 | 102,015 | .35 | (2) | (2) | (2) |
| Blast | 4,380 | 25,010 | 5.71 | | | |
| Engine | 84,895 | 101,191 | 1.19 | 80,782 | 62,597 | .77 |
| Filter | 63,315 | 14,110 | .22 | (2) | (2) | (2) |
| Ground | 16,233 | 129,155 | 7.96 | (2) | (2) | (2) |
| Railroad ballast | 78,256 | 21,185 | .27 | 72,928 | 36,464 | .50 |
| Other | 521,855 | 217,119 | .42 | 423,578 | 224,799 | .53 |
| Undistributed [3] | | | | 600,860 | 1,154,472 | 1.92 |
| Total sand | 13,141,249 | 11,098,063 | .84 | 14,234,815 | 12,109,248 | .85 |
| Gravel: | | | | | | |
| Building | 4,428,446 | 4,421,163 | 1.00 | 5,218,563 | 5,391,239 | 1.03 |
| Paving | 12,723,987 | 10,195,155 | .80 | 15,185,556 | 13,552,530 | .89 |
| Railroad ballast | 283,761 | 222,216 | .78 | 233,721 | 226,509 | .97 |
| Other | 461,070 | 314,475 | .68 | 355,417 | 230,993 | .65 |
| Total gravel | 17,897,264 | 15,153,009 | .85 | 20,993,257 | 19,401,271 | .92 |
| Total commercial sand and gravel | 31,038,513 | 26,251,072 | .85 | 35,228,072 | 31,510,519 | .89 |
| **GOVERNMENT-AND-CONTRACTOR OPERATIONS** | | | | | | |
| Sand: | | | | | | |
| Building | 5,539 | 1,662 | .30 | 1,620 | 405 | .25 |
| Paving | 406,711 | 129,616 | .32 | 809,456 | 310,066 | .38 |
| Total sand | 412,250 | 131,278 | .32 | 811,076 | 310,471 | .38 |
| Gravel: | | | | | | |
| Building | 30,954 | 9,286 | .30 | 8,897 | 2,669 | .30 |
| Paving | 5,732,742 | 3,099,139 | .54 | 6,101,901 | 3,322,294 | .54 |
| Total gravel | 5,763,696 | 3,108,425 | .54 | 6,110,798 | 3,324,963 | .54 |
| Total Government-and-contractor sand and gravel | 6,175,946 | 3,239,703 | .52 | 6,921,874 | 3,635,434 | .53 |
| **ALL OPERATIONS** | | | | | | |
| Sand | 13,553,499 | 11,229,341 | .83 | 15,045,891 | 12,419,719 | .83 |
| Gravel | 23,660,960 | 18,261,434 | .77 | 27,104,055 | 22,726,234 | .84 |
| Grand total | 37,214,459 | 29,490,775 | .79 | 42,149,946 | 35,145,953 | .83 |

[1] Includes friable sandstone.
[2] Included with "Undistributed" to avoid disclosing individual company confidential data.
[3] Includes glass, grinding and polishing, filter, and ground sand.

Digitized by Google

The 10 leading commercial producers of sand and gravel were: American Aggregates Corp., Kalamazoo, Livingston, and Oakland Counties; Construction Aggregates Corp., Ottawa County; Grand Rapids Gravel Co., Kent County; Sand Products Corp., Manistee and Muskegon Counties; H. F. Stukey, Branch County; Lyle J. Walker Sand & Gravel, Oakland County; Whittaker & Gooding Co., Washtenaw County; and O. E. Gooding & Co., Harry Pickitt, and John G. Yerington, all operating portable plants throughout the State.

**Stone.**—Stone production in 1956 was slightly greater than in 1955 and was valued at $31 million. Over 90 percent of the production was reported from 6 counties: Alpena, Chippewa, Mackinac, Monroe, Presque Isle, and Schoolcraft. Some of the world's largest limestone quarries are operated in Presque Isle and Schoolcraft Counties.

Relatively small quantities of dimension stone (limestone and sandstone) were produced. A very high proportion of the stone output was sold as crushed or broken stone. Crushed limestone and dolomite comprised 99 percent of the Michigan total. Changes in the distribution pattern reflect the economic forces at work in the State during 1956. As a result of the steel strike, the demand for flux was 1.6 million tons less than in 1955. Increased activity in road construction and in building and industrial uses for stone (notably in cement and lime manufacture) resulted in sizable increases in demand for stone in these categories.

Principal producers of limestone in 1956 were: Drummond Dolomite, Inc., Chippewa County; The France Stone Co. and Michigan Stone Co., Monroe County; Inland Lime & Stone Co., Schoolcraft County; Edward Kraemer & Sons, Wayne County; Michigan Limestone Division of United States Steel Corp., Mackinac and Presque Isle Counties; Penn-Dixie Cement Corp., Emmet County; Presque Isle Corp. (Chemstone Corp.), Presque Isle County; The Wallace Stone Co., Huron County; and Wyandotte Chemicals Corp., Alpena County.

**TABLE 10.—Dimension stone sold or used by producers, 1952–56, by kinds**

| Year | Limestone | | Sandstone | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | 5,322 | $45,925 | 908 | $5,126 | 6,230 | $51,051 |
| 1953 | 4,849 | 53,425 | 369 | 2,624 | 5,218 | 56,049 |
| 1954 | 8,938 | 68,984 | 3,524 | 31,235 | 12,462 | 100,219 |
| 1955 | 29,907 | 113,912 | 9,429 | 79,410 | 39,336 | 193,322 |
| 1956 | 35,017 | 110,159 | 11,190 | 90,820 | 46,207 | 200,979 |

465877—58——38

Digitized by Google

**TABLE 11.—Crushed and broken stone sold or used by producers, 1955–56, by kinds and uses**

| Kind and use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| Limestone: | | | | | | |
| Riprap: | | | | | | |
| Commercial | 20,142 | $15,747 | $0.78 | (1) | (1) | (1) |
| Noncommercial | 64,616 | 77,539 | 1.20 | | | |
| Flux | 15,717,028 | 13,657,112 | .87 | 14,098,821 | $12,954,583 | $0.92 |
| Concrete aggregate, roadstone: | | | | | | |
| Commercial | 4,527,389 | 4,839,244 | 1.07 | 5,315,862 | 5,781,629 | 1.09 |
| Noncommercial | 191,135 | 155,850 | .82 | 229,605 | 213,664 | .93 |
| Railroad ballast | 231,439 | 249,506 | 1.08 | 204,210 | 241,157 | 1.18 |
| Agriculture | 633,483 | 612,501 | .97 | 538,439 | 657,919 | 1.22 |
| Other [2] | 12,106,499 | 8,954,390 | .74 | 13,526,186 | 10,871,362 | .80 |
| Total commercial | 33,235,980 | 28,328,410 | .85 | 33,683,518 | 30,506,650 | .91 |
| Total noncommercial | 255,751 | 233,389 | .91 | 229,605 | 213,664 | .93 |
| Total limestone | 33,491,731 | 28,561,799 | .85 | 33,913,123 | 30,720,314 | .91 |
| Sandstone: | | | | | | |
| Filler | | | | 1,080 | 540 | .50 |
| Foundry | 50 | 100 | 2.00 | | | |
| Total sandstone | 50 | 100 | 2.00 | 1,080 | 540 | .50 |
| Miscellaneous stone: | | | | | | |
| Concrete aggregate, roadstone: | | | | | | |
| Commercial | 49,916 | 95,416 | 1.91 | | | |
| Noncommercial | 54,579 | 58,147 | 1.07 | 38,420 | 88,342 | 2.30 |
| Total miscellaneous stone | 104,495 | 153,563 | 1.47 | 38,420 | 88,342 | 2.30 |
| Total commercial | 33,285,946 | 28,423,926 | .85 | 33,684,598 | 30,507,190 | .91 |
| Total noncommercial | 310,330 | 291,536 | .94 | 268,025 | 302,006 | 1.13 |
| Grand total | 33,596,276 | 28,715,462 | .85 | 33,952,623 | 30,809,196 | .91 |

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Includes limestone for chemical uses, whiting or whiting substitutes, asphalt filler, dust for coal mines, mineral food, poultry grit, stone sand, cement, lime, other miscellaneous uses, and footnote 1.

## MINERAL FUELS

**Natural Gas and Natural-Gas Products.**—Natural-gas output increased to 10,911 million cubic feet. At the end of 1956 natural gas was being produced from 70 fields.[2] The largest production was reported from Northville field in Wayne and Washtenaw Counties, Howell field in Livingston County, Beaver Creek field in Crawford and Kalkaska Counties, and North Hamilton field in Clare County. The production of natural-gas products was about the same as in1955.

**Peat.**—About 31,000 tons of peat valued at $475,000 was produced from bogs in Kalamazoo, Mason, and St. Clair Counties in 1956. Volume and sales were slightly higher than in 1955. The output was used for soil conditioning.

**Petroleum.**—Petroleum production declined to 10.7 million barrels in 1956. This was about half a million barrels less than in 1955.

[2] Michigan Department of Conservation, Geological Survey Division, Summary of Operations, Oil and Gas Fields 1956: Lansing, 1957, 37 pp.

Digitized by Google

The Michigan Department of Conservation [3] reported 165 producing oilfields at the end of 1956. In all, 196 exploratory and development oil wells were completed in 1956 compared with 204 in 1955. Production of over 1 million barrels each was reported from Arenac, Clare, and Isabella Counties. Fifteen refineries, with a rated capacity of 161,600 barrels daily, were operated in Michigan during 1956.

## REVIEW BY COUNTIES

**Alcona.**—The county road commission produced sand and gravel for road construction. The Michigan State Highway Department contracted for road gravel.

**Alger.**—Mrs. Hilma Samuelson (Chatham), Olga Winkka (Marquette), and the county road commission produced sand and gravel for road construction. Duluth, South Shore & Atlantic Railroad Co. produced engine sand. The Michigan State Highway Department contracted for road gravel.

**Allegan.**—L. Z. Arndt (Fennville) and Gerald Arnsman (Hopkins) reported production of marl for agricultural use. Natural gas and petroleum were produced. Gravel for road construction was produced by Huitt & Son and Harry Pickitt, both of Allegan; John G. Yerington, Benton Harbor; Cleo L. Arndt, Fennville; Ralph W. Bodine, Otsego; and West Shore Construction Co., Zeeland. Building sand and gravel was produced by Ben Waanders (Allegan) and Ralph W. Bodine (Otsego).

**Alpena.**—Cement production in Alpena County was the largest in the State. Huron Portland Cement Co. (Alpena) produced portland and masonry cements and shale for cement manufacture. This plant, one of the largest in the country, has 24 kilns in operation. Wyandotte Chemicals Corp. (Wyandotte) produced limestone from a quarry near Alpena, chiefly for the manufacture of alkali and cement. Gilliland Gravel Co. (Alpena) produced gravel for road construction.

**TABLE 12.—Value of minerals produced in Michigan, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Alcona | $25,442 | $34,763 | Sand and gravel. |
| Alger | 106,312 | 72,921 | Do. |
| Allegan | 819,123 | 797,373 | Petroleum, sand and gravel, marl. |
| Alpena | 28,022,365 | 31,435,872 | Cement, stone, clays, sand and gravel. |
| Antrim | 62,835 | 159,437 | Sand and gravel, stone. |
| Arenac | 4,637,062 | 3,811,363 | Petroleum, stone, sand and gravel. |
| Baraga | 1,071,130 | 963,138 | Iron ore, sand and gravel. |
| Barry | 322,884 | 725,691 | Sand and gravel, petroleum, marl. |
| Bay | 7,997,665 | 11,187,626 | Cement, petroleum, clays, lime. |
| Benzie | 17,930 | 10,011 | Sand and gravel. |
| Berrien | 271,306 | 356,229 | Do. |
| Branch | 126,022 | 367,790 | Sand and gravel, marl. |
| Calhoun | 228,274 | 184,037 | Sand and gravel, marl, stone. |
| Cass | 188,329 | 148,600 | Sand and gravel, marl. |
| Charlevoix | 33,564 | 20,935 | Stone. |
| Cheboygan | 33,006 | 66,838 | Sand and gravel, stone. |
| Chippewa | (2) | (2) | Stone, sand and gravel. |
| Clare | 3,344,139 | 3,023,732 | Petroleum, sand and gravel. |
| Clinton | 323,374 | 434,107 | Sand and gravel, clays. |
| Crawford | 732,090 | 675,448 | Petroleum, sand and gravel. |
| Delta | 149,371 | 312,591 | Sand and gravel. |
| Dickinson | 342,256 | 362,226 | Iron ore, stone, sand and gravel. |
| Eaton | 435,024 | 431,880 | Stone, sand and gravel, clays. |
| Emmet | (2) | 8,091,239 | Cement, stone, clays, sand and gravel. |

See footnotes at end of table, p. 12.

Work cited in footnote 2.

Digitized by Google

**TABLE 12.—Value of minerals produced in Michigan, 1955–56, by counties [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Genesee | $678,219 | $639,706 | Sand and gravel, petroleum. |
| Gladwin | 1,263,853 | 1,242,317 | Petroleum, sand and gravel. |
| Gogebic | 23,291,941 | 23,271,399 | Iron ore, sand and gravel. |
| Grand Traverse | 67,998 | 105,556 | Sand and gravel. |
| Gratiot | (2) | (2) | Salines, salt, sand and gravel, petroleum, clays. |
| Hillsdale | 510,809 | 591,707 | Sand and gravel, marl. |
| Houghton [3] | 38,051,896 | 20,420,105 | Copper, sand and gravel, stone. |
| Huron | (2) | 991,701 | Stone, sand and gravel, petroleum. |
| Ingham | 646,306 | 754,219 | Sand and gravel. |
| Ionia | 130,777 | (4) | Sand and gravel, petroleum. |
| Iosco | (2) | (2) | Gypsum. |
| Iron | 31,247,129 | 28,348,290 | Iron ore, stone, sand and gravel. |
| Isabella | 4,038,519 | 3,648,878 | Petroleum, sand and gravel, marl. |
| Jackson | 472,400 | 545,386 | Sand and gravel, stone, petroleum, marl. |
| Kalamazoo | 584,567 | 977,413 | Sand and gravel, petroleum, marl, peat. |
| Kalkaska | 174,072 | 203,606 | Petroleum, sand and gravel. |
| Kent | 3,370,505 | 3,519,850 | Sand and gravel, gypsum, petroleum. |
| Lake | 95,061 | 68,832 | Sand and gravel, petroleum. |
| Lapeer | 333,527 | 396,825 | Salines, sand and gravel, petroleum. |
| Leelanau | 50,327 | 41,439 | Sand and gravel. |
| Lenawee | (2) | (2) | Cement, sand and gravel, clays. |
| Livingston | 3,370,581 | 3,995,526 | Sand and gravel. |
| Luce | 36,685 | 24,869 | Do. |
| Mackinac | (2) | (2) | Stone, sand and gravel. |
| Macomb | 1,274,801 | 1,425,795 | Sand and gravel. |
| Manistee | 8,549,216 | 9,552,643 | Salt, salines, sand and gravel. |
| Marquette | 49,435,661 | 46,216,560 | Iron ore, sand and gravel, stone. |
| Mason | 5,321,007 | 4,822,617 | Salines, petroleum, lime, sand and gravel, peat. |
| Mecosta | 478,100 | 445,636 | Petroleum, sand and gravel, marl. |
| Menominee | 841,499 | (2) | Lime, sand and gravel. |
| Midland | (2) | (2) | Salines, salt, petroleum, sand and gravel. |
| Missaukee | 1,613,162 | 1,542,465 | Petroleum, sand and gravel, marl. |
| Monroe | 1,415,547 | 1,266,333 | Stone, petroleum, clays. |
| Montcalm | 1,107,773 | 2,184,555 | Petroleum, sand and gravel. |
| Montmorency | (2) | 20,957 | Sand and gravel. |
| Muskegon | 1,650,251 | 1,422,666 | Salt, sand and gravel, petroleum. |
| Newaygo | 679,359 | 1,003,224 | Petroleum, sand and gravel. |
| Oakland | 5,975,531 | 7,071,834 | Sand and gravel, petroleum. |
| Oceana | 1,985,460 | 1,674,262 | Petroleum, sand and gravel. |
| Ogemaw | 2,702,964 | 2,479,529 | Do. |
| Ontonagon | (4) | (2) | Copper, silver, sand and gravel. |
| Osceola | 2,055,454 | 1,961,210 | Petroleum, sand and gravel, marl. |
| Oscoda | 15,012 | 16,025 | Sand and gravel, petroleum. |
| Otsego | 55,691 | 59,112 | Do. |
| Ottawa | 1,588,103 | 2,260,676 | Sand and gravel, petroleum, marl. |
| Presque Isle | (2) | (2) | Stone, sand and gravel. |
| Roscommon | 1,294,588 | 1,328,178 | Petroleum, sand and gravel. |
| Saginaw | 137,435 | 121,353 | Petroleum, clays. |
| St. Clair | 13,104,478 | 12,583,692 | Salt, cement, peat, clays, sand and gravel, petroleum. |
| St. Joseph | 172,099 | 364,157 | Sand and gravel, marl. |
| Sanilac | 98,774 | 193,653 | Sand and gravel. |
| Schoolcraft | 4,081,756 | 3,991,616 | Stone, sand and gravel. |
| Shiawassee | 201,097 | 225,624 | Sand and gravel, clays. |
| Tuscola | 1,306,500 | 1,602,496 | Sand and gravel, petroleum. |
| Van Buren | 313,736 | 222,725 | Petroleum, sand and gravel. |
| Washtenaw | 1,583,985 | 1,749,961 | Sand and gravel, petroleum. |
| Wayne | 29,470,153 | 38,827,736 | Salt, cement, sand and gravel, clays, stone, petroleum. |
| Wexford | 42,079 | 53,674 | Sand and gravel. |
| Undistributed [5] | 67,530,624 | 100,021,558 | |
| Total | 363,787,000 | [6] 394,536,000 | |

[1] Gem stones, natural gas, and natural-gas liquids not listed by counties as data are not available. Value included with "Undistributed."
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Includes value of mineral production in Keweenaw County (1956) and Keweenaw and Ontonagon Counties (1955).
[4] Value indicated by footnote 3.
[5] Includes value of items referenced in footnotes 1 and 2 and value of petroleum and sand and gravel production not assignable to specific counties.
[6] Total has been adjusted to eliminate duplicating value of clays and stone.

Digitized by Google

**Antrim.**—Gravel for road construction was produced by The Taber Co., Grand Rapids; and Mid-America Engineering Corp., Skokie, Ill., and Harry Pickitt, Allegan (both operating pits near Alba). The county road commission produced road sand and gravel and crushed stone for concrete aggregate. The Michigan State Highway Department and the county road commission contracted for road sand and gravel.

**Arenac.**—Building sand and gravel was produced by Melvil O. Eastman and Shirley Van Deusen, both of Standish. Shirley Van Deusen also produced road gravel. Crushed limestone for concrete aggregate was produced by the Iosco County Highway Department and the Arenac County Road Commission. Petroleum was produced.

**Baraga.**—The Cleveland-Cliffs Iron Co. produced iron ore from the Ohio open-pit mine. The crude ore was concentrated in a plant using dense-medium and other gravity separation. Sand and gravel for road construction was produced by and for the county road commission. The Michigan State Highway Department contracted for road sand and gravel.

**Barry.**—Marl for agricultural use was produced by H. A. Carlton Schau, Kalamazoo. Sand and gravel was produced for building, road construction, and other uses. Sand and gravel producers who operated in the county were Harry Pickitt, Allegan; John G. Yerington, Benton Harbor; Cole Gravel Co., Dorr; Bender Gravel Co., Hastings; Nashville Gravel Co. and A. D. Pennock, both of Nashville; West Shore Construction Co., Zeeland; and the county road commission. The Michigan State Highway Department contracted for road gravel. Petroleum also was produced.

**Bay.**—Aetna Portland Cement Co. (Bay City) produced portland and masonry cement, and clay for the manufacture of cement. The company operated 5 kilns. The Monitor Sugar Division of Robert Gage Coal Co. (Bay City) produced quicklime for sugar refining Petroleum was produced.

**Benzie.**—The Michigan State Highway Department contracted for road gravel.

**Berrien.**—Production of engine and molding sand was reported by Producers Core Sand Corp. (Michigan City, Ind.) which operated at a site near Sawyer. Sand and gravel also was produced for building, road construction, and other uses. Producers that reported operations in Berrien County were John G. Yerington, Benton Harbor; Fred M. Ott, Bridgman; Wakeman and Neva Ryno, Coloma; Harold Kiell, Niles; and Ireland & Lester Co., St. Joseph. The Michigan State Highway Department contracted for road gravel.

**Branch.**—Case Bros. (Sherwood) and Cleveland & Taylor (Fremont, Ind.) produced marl for agricultural purposes. Marl pits were located near Coldwater and Union City. Sand and gravel was produced for building, road construction, and miscellaneous uses. Sand and gravel producers that operated in Branch County were H. F. Stukey and Woodward-Pollock Lumber Co., both of Coldwater; Union City Gravel Co., Union City; and the county road commission.

**Calhoun.**—Marl for agricultural purposes was produced by Carl Avery, Athens; Case Bros., Sherwood; and Arnie Delebaugh and Clyde M. Reed, both of Union City. Marl pits were located near Marshall and Union City. Sand and gravel was produced for building and road

Digitized by Google

construction by Harry Pickitt, Allegan; Battle Creek Gravel Co., Battle Creek; John Alexander, Sr., Marshall; Emil Combs, Tekonsha; and West Shore Construction Co., Zeeland. The Michigan State Highway Department contracted for road gravel. Sandstone used as rubble was produced by Earl A. Flock, Battle Creek.

The Battle Creek Gravel Co. used limestone chips in place of gravel in producing ready-mixed concrete because of the depletion of its gravel deposit.

**Cass.**—Marl for agricultural purposes was produced by Frank R. Hixon, Marcellus. Sand and gravel was produced for building and road construction. Sand and gravel producers that operated in Cass County were John G. Yerington, Benton Harbor; Nieb Concrete Products Co., Niles; and the county road commission.

**Charlevoix.**—Limestone used for rough construction, flux, and agricultural purposes was produced by Charlevoix Lime & Stone Co., Vanderbilt, which operated a quarry near Charlevoix.

**Cheboygan.**—Sand and gravel was produced for building and road construction by Harry Pickitt (Allegan) and Hugh H. Mason & Sons (Gaylord) The Michigan State Highway Department contracted for road gravel. Limestone for concrete aggregate was produced by Afton Stone & Lime Co., Afton.

**Chippewa.**—Road gravel was produced by I. L. Whitehead Co. (Sault Ste. Marie) and the county road commission. The Michigan State Highway Department contracted for road gravel. Limestone produced by Drummond Dolomite, Inc. (Sheboygan, Wis.), operating from a site near Drummond, was used for flux, concrete aggregate, and agricultural stone.

**Clare.**—Clare County ranked third in the production of petroleum. Natural gas also was produced. Road gravel was produced by Adrian Blades, Beaverton.

**Clinton.**—Clay for heavy clay products was produced by Grand Ledge Clay Products Co., Grand Ledge. Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Clinton County were Harry Pickitt, Allegan; E. P. Brady & Co., Flint; Boichot Concrete Products Corp., Lansing; Walling Gravel Co., St. Johns; West Shore Construction Co., Zeeland; and the county road commission. Walling Gravel Co. also reported production of filter sand.

**Crawford.**—Natural gas and petroleum were produced. The county road commission produced road sand and gravel.

**Delta.**—Sand and gravel was produced for building and road construction by Bichler Bros., Escanaba; Cloverland Milling & Supply Co. and Days River Sand & Gravel Co., both of Gladstone; and the county road commission. The Escanaba & Lake Superior Railroad reported the production of engine sand. The Michigan State Highway Department contracted for road gravel.

**Dickinson.**—Iron ore was produced by Jackson Iron & Steel Co. at the Bradley mine. The Cornell mine was operated by the Globe Mining Co. until July 20, when it was sold to Cornell Mining Co. (Pickands Mather & Co., operating agents). Road sand and gravel was produced by the county road commission. Limestone used largely for soil conditioning and other applications was produced by Superior Rock Products Co., Sagola. The Metro-Nite Co. (Mil-

Digitized by Google

waukee, Wis.) produced limestone from a quarry near Felch for concrete aggregate and whiting.

**Eaton.**—Clay for heavy clay products was produced by American Vitrified Products Co. and Grand Ledge Clay Products Co., both of Grand Ledge. Sand and gravel production for road construction and other uses was reported by Vermontville Gravel Co. (Vermontville) and West Shore Construction Co. (Zeeland). The Michigan State Highway Department contracted for road gravel. Limestone for rubble, concrete aggregate, and agricultural purposes, was produced by Cheney Limestone Co., Bellevue.

**Emmet.**—Penn-Dixie Cement Corp. (Petoskey) produced portland and masonry cements and clay and limestone used in manufacturing cement. An additional kiln, 375 feet long, was put in operation early in 1956, increasing the number of kilns in operation to 5. The Michigan State Highway Department contracted for road gravel.

**Genesee.**—Petroleum was produced. Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Genesee County were Harry Pickitt, Allegan; Justus Snelenberger, Burt (from dredge operations near Montrose); Kurtz Gravel Co., Flint; Hansen Gravel Co., Flushing; Mathews Gravel Co. and Otisville Stone Co., both of Mount Morris; Ferguson Excavating Co., Davison; Saginaw Core Sand Co., Saginaw; and John Post & Sons, Swartz Creek. Filter sand also was produced by Kurtz Gravel Co. and Mathews Gravel Co. The Michigan State Highway Department contracted for road gravel.

**Gladwin.**—Petroleum was produced. Paul C. Miller (Sparta) produced road gravel. The Michigan State Highway Department contracted for road sand and gravel.

**Gogebic.**—Iron ore was produced by North Range Mining Co. and Pickands Mather & Co. from an underground mine; Pittsburgh Pacific Co., from an open-pit; and Zontelli Bros., Inc., from its stockpile. Sand and gravel production for road construction was reported by Ironwood Concrete Products Co. and for building purposes by Lake Superior Gravel Co., both of Ironwood. Road gravel also was produced by the county road commission. The Michigan State Highway Department contracted for road gravel.

**Grand Traverse.**—Paul C. Miller (Sparta) produced road gravel. The Michigan State Highway Department contracted for road gravel.

**Gratiot.**—Bromine and bromine compounds, calcium magnesium chloride (liquid), magnesium compounds, and salt were produced from natural well brines by Michigan Chemical Corp., St. Louis. The salt output was for table use and various chemical and industrial purposes. The company planned new laboratories for research in the field of rare earths. Miscellaneous clay for heavy clay products was produced by Clay Products Co., St. Louis. Natural gas and petroleum were produced. Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Gratiot County were E. P. Brady & Co., Flint; The Taber Co., Grand Rapids; Roy Dayringer and North Star Gravel Co., both of Ithaca; and the county road commission.

**Hillsdale.**—Cleveland & Taylor (Fremont, Ind.) produced marl from a pit near Camden for agricultural purposes. Sand and gravel was produced for building and road construction. Producers that

Digitized by Google

operated in Hillsdale County were Elliott Ice & Coal Co. and Art Russell's Concrete Products, both of Hillsdale; Bundy Hill Gravel Co., Somerset Center; Hoover Bros., Waldron; Northwest Materials, Inc., Bryan, Ohio, and Southern Michigan Materials, Inc., Columbus, Ohio, both of whom operated pits near Ransom; and the county road commission.

**Houghton.**—Copper was produced by Calumet & Hecla, Inc., Calumet; Copper Range Co., Painesdale; and Quincy Mining Co., New York, N. Y. Duluth, South Shore & Atlantic Railroad Co. produced sand for railroad ballast. The Michigan State Highway Department contracted for road sand and gravel. The county road commission produced crushed stone for concrete aggregate.

Primary copper production at the Calumet & Hecla, Inc., operations reached the highest level in recent years. The grade of ore was below that of the preceding year because of mining in marginal areas and pillar extraction. The average daily production of ore, however, increased slightly. One shaft was closed early in the year, when its developed ore reserves were depleted. Production at another shaft, reopened late in 1955, and at the unwatered Osceola No. 13 shaft more than compensated for the shutdown. The company was producing through 9 shafts from 10 mines at the year end. Production of copper at the Tamarack reclamation plant increased, with copper recovery per pound of tailings treated again improving. All reclamation operations were on the Ahmeek sandbank, and 1 million tons of tailing was processed during 1956. Enough remained for approximately 10 more years of processing according to the company 1956 annual report.

Calumet & Hecla, Inc., leaching operations were on a limited scale in 1956 because of the high price and scarcity of secondary materials. Only the Lake Linden plant was operated.

Copper Range Co. Champion mine operated without interruption throughout the year. About 400,000 tons of copper ore was shipped to the Freda concentrator. Although the grade of ore was slightly better than in 1955, dilution of stope rock decreased the copper content. It was necessary to install pumps in the No. 3 shaft to maintain the water level below the 18th level. In addition to milling the Champion-mine ore, the Freda concentrator processed over 100,000 tons of tailing from the Redridge sands.

The Quincy Mining Co. operated its reclamation plant at Torch Lake and treated nearly 1 million tons of stamp sands—about 10 percent more than in 1955. The original reclamation-plant dredge sank during a severe storm in January 1956. An idle dredge formerly operated by Calumet & Hecla, Inc., was purchased, and reclamation operations continued. This dredge had greater capacity than the old Quincy dredge. The company smelter at Hancock was in continuous operation throughout the year, treating and refining company concentrates and concentrates from the Freda mill of Copper Range Co.

**Huron.**—Petroleum was produced. Production of sand and gravel for road construction was reported by O. E. Gooding & Co. (Ypsilanti) and the county road commission. The Michigan State Highway Department contracted for road sand. Dimension limestone for use as architectural and building stone and crushed limestone for con-

Digitized by Google

crete aggregate, flux, and agricultural purposes, was produced by The Wallace Stone Co., Bay Port.

**Ingham.**—Filter sand and sand and gravel for building, road construction, railroad ballast, and other uses were produced. Producers that reported operations in Ingham County were Central Michigan Sand & Gravel, East Lansing; Cheney Gravel Co., Holt; The Ferris Co. and Mason Gravel Co., both of Mason; West Lansing Gravel Co., Lansing; O. E. Gooding & Co., Ypsilanti; and the county road commission.

**Ionia.**—Road gravel was produced by Harry Pickett (Allegan) and the county road commission. Petroleum was produced.

**Iosco.**—Crude gypsum was quarried by the National Gypsum Co. (National City) and United States Gypsum Co. (Alabaster). The principal uses for gypsum were in manufacturing several types of plaster and wallboard and as a portland-cement retarder.

National Gypsum Co. planned development of a 75-million-ton gypsum deposit on a 2,700-acre tract near Tawas City.

**Iron.**—Iron ore from underground mines was produced by The Cleveland-Cliffs Iron Co., M. A. Hanna Co., Inland Steel Co., North Range Mining Co., Pickands Mather & Co., and Republic Steel Corp. The county road commission produced road gravel, and the Michigan State Highway Department contracted for road sand and gravel. Limestone for rubble, concrete aggregate, and miscellaneous purposes was produced by Caspian Lumber & Coal Co., Caspian. Iron River Lumber & Fuel Co. (Iron River) produced limestone for concrete aggregate.

**Isabella.**—Marl for agricultural purposes was produced by William Stuart, Mount Pleasant. Natural gas and petroleum were produced. Production of sand and gravel for building, road construction, and other uses was reported by George Hubscher & Son, Mount Pleasant.

**Jackson.**—Marl for agricultural purposes was produced by Barnes & Van Antwerp, Horton. Petroleum was produced. Sand and gravel was produced for building and road construction by W. A. Cecil & Sons, Concord; Klumpp Bros. Gravel Co., Grass Lake; Edward Palmer & Son, Jackson; O. E. Gooding & Co., Ypsilanti; and the county road commission. The county road commission also contracted for road gravel. Limestone for concrete aggregate and agricultural stone was produced by John C. Jeffrey, Parma. The Original Sandstone Quarry, Ray's Stone Quarry, and Star Sandstone Co.—all of Napoleon—produced sandstone, for use in rough construction and as rubble, flagging, and filler.

**Kalamazoo.**—Lawrence Hayward (Scotts) and Dan Slack (Kalamazoo) produced marl for agricultural purposes. Petroleum was produced. Sand and gravel was produced for building, road construction, and railroad ballast. Producers that operated in Kalamazoo County were Harry Pickitt, Allegan; John G. Yerington, Benton Harbor; Gravel Producers, Inc., and Casper H. Haas Co., both of Kalamazoo; and American Aggregates Corp., Greenville, Ohio, which operated at a site near Kalamazoo. The city engineer of Kalamazoo and the Michigan State Highway Department contracted for road sand and gravel. Peat was produced by Craven's Peat Moss, Kalamazoo.

Digitized by Google

**Kalkaska.**—Natural gas and petroleum were produced. Sand and gravel for road construction was produced by Paul C. Miller (Sparta) and the county road commission.

**Kent.**—Bestwall Gypsum Co. and Grand Rapids Plaster Co., both of Grand Rapids, mined crude gypsum and operated processing plants. Wallboard, lath, exterior sheathing, and prepared plasters, were produced. Sand and gravel for building, road construction, and other uses was produced in Kent County by Harry Pickitt, Allegan; Coit Avenue Gravel Co., Edward De Vries & Sons, Grand Rapids Gravel Co., Pekaar & Van Doorn, and Riverside Sand & Gravel Co., all of Grand Rapids; H. F. Postma Gravel Co., Grandville; West Shore Construction Co., Zeeland; The Chesapeake & Ohio Railway Co.; and the county road commission. The city engineer of Grand Rapids, the Michigan State Highway Department, and the county road commission contracted for road sand and gravel. Perlite, produced in Western States, was expanded by Bestwall Gypsum Co. and Gregg Products Co. (Grand Rapids) for use as lightweight aggregate and as a plaster admixture. Natural gas and petroleum were produced.

**Keweenaw.**—Copper was produced by Calumet & Hecla, Inc., Calumet. The county road commission produced road gravel.

**Lake.**—The Taber Co. (Grand Rapids) and the county road commission produced road sand and gravel. Petroleum was produced.

**Lapeer.**—Liquid calcium-magnesium chloride was produced by Wilkinson Chemical Corp., Mayville. Sand and gravel was produced for building and road construction by Pine Sand & Gravel (Lapeer) and the county road commission. The Michigan State Highway Department contracted for road gravel. Petroleum was produced.

**Leelanau.**—The Taber Co. (Grand Rapids) and the county road commission produced road gravel.

**Lenawee.**—Consolidated Cement Corp. (Cement City) produced portland and masonry cements. Comfort Brick & Tile Co. (Tecumseh) produced clay used in manufacturing heavy clay products. Sand and gravel for building, road construction, and other uses, was produced. Producers that reported operations in Lenawee County were Adrian Sand & Gravel, Stamm Bros. Gravel Co., and John Woerner, all of Adrian; Cy Page, Manitou Beach; Porter Sand & Gravel Co. and Tecumseh Gravel Co., both of Tecumseh; O. E. Gooding & Co., Ypsilanti; and the county road commission.

**Livingston.**—Natural gas was produced. Sand and gravel for building and road construction was produced by Harry Pickitt, Allegan; D & J Gravel Co., Fowlerville; Van E. Dailey, Howell; and American Aggregates Corp., Greenville, Ohio, which operated at a site near Brighton. The Michigan State Highway Department contracted for road sand and gravel.

**Luce.**—Road gravel was produced by the county road commission.

**Mackinac.**—Gravel for building purposes was produced by Duluth, South Shore & Atlantic Railroad Co. Fiborn Limestone Co., Sault Ste. Marie, Ontario, Canada, shipped limestone from a quarry near Fiborn for use as concrete aggregate. Limestone for flux, concrete aggregate, agricultural stone, asphalt filler, rock dust for coal mines, poultry grit, and lime was produced by the Michigan Limestone Division, United States Steel Corp. (Detroit) from a quarry near Cedarville.

Digitized by Google

**Macomb.**—Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Macomb County were Bernie Reif and Rosteck Contractors, both of Fraser; Maertens Sand & Gravel Co., Grosse Pointe; Allen Zavits, Mount Clemens; S. K. Rogers, New Baltimore; Ray Industries, Inc., Oxford; Fred Kaatz, Richmond; Hygrade Sand & Gravel Co. and Smith Sand & Gravel Co., both of Romeo; Louis Marsack & Sons, St Clair Shores; Advance Building Materials Co., Great Lakes Gravel Co., Macomb Sand & Gravel, Michigan Sand & Gravel, Morgan Sand & Gravel Co., and Underwood Sand & Gravel Co., all of Utica; and the county road commission. The Michigan State Highway Department and the county road commission contracted for road sand and gravel.

**Manistee.**—Bromine and bromine compounds, calcium-magnesium chloride (liquid), magnesium compounds, and salt were produced at Manistee, by the Morton Salt Co. Bromine and bromine compounds were produced also by Great Lakes Chemical Corp. (Manistee) and Michigan Chemical Corp. (Eastlake). Magnesium compounds were produced by Standard Lime & Cement Co (Manistee) for the manufacture of refractory magnesia. Salt produced by the Manistee Salt Works was sold for table use, animal food, and food processing. It was also employed in several industrial processes. Frank L. Gauthier (Onekama) produced sand and gravel for building and other uses. Molding and grinding and polishing sands were produced by Sand Products Corp. (Detroit) which operated a plant at Manistee. The Ann Arbor Railroad Co. produced gravel for railroad ballast. The county road commission produced road gravel. The Michigan State Highway Department and the county road commission contracted for road gravel.

**Marquette.**—Iron ore was produced by The Cleveland-Cliffs Iron Co. from 3 open-pit and 6 underground mines, Inland Steel Co. from 2 underground mines, Jones & Laughlin Steel Corp. and North Range Mining Co. from underground mines, and Pickands Mather & Co. from an open-pit mine.

The Republic and Humboldt open-pit mines of The Cleveland-Cliffs Iron Co. produced from the jasper iron formation. The ore consists of specular hematite, intermixed with cherty material. After concentration the material is sintered or pelletized.

Sand and gravel was produced for building and road construction by A. Lindberg & Sons, Inc. (Ishpeming), and the county road commission. Engine sand and railroad-ballast gravel were produced by Lake Superior & Ishpeming Railroad. The Michigan State Highway Department and the county road commission contracted for road sand and gravel. Limestone was crushed for use as concrete aggregate.

**Mason.**—The Dow Chemical Co. at Ludington produced bromine; calcium chloride; quicklime for use in paper, sewage, water purification, and other metallurgical and chemical uses; and magnesium compounds. Natural gas and petroleum were produced. The county road commission produced and also contracted for road gravel. Peat was produced by Irving L. Pratt & Son, Scottville.

**Mecosta.**—Wilson Frost (Blanchard) produced marl for agricultural purposes. Natural gas and petroleum were produced. Sand and gravel was produced for building and road construction. Producers that reported operations in the county were Steve Lyle Sand & Gravel,

Digitized by Google

Big Rapids; Paul C. Miller, Sparta; and the county road commission. The Michigan State Highway Department contracted for road gravel.

**Menominee.**—Limestone Products Co. (Menominee) produced quick and hydrated lime for various chemical and industrial uses. Sand and gravel for building and road construction was produced by Walsh Sand & Gravel Co., Menominee, and the county road commission.

**Midland.**—The Dow Chemical Co. at Midland produced bromine and bromine compounds, calcium chloride, magnesium compounds, potash, and salt for use in chlorine and other chemicals from brines obtained from wells at Midland. Natural gas and petroleum were produced. Saginaw Core Sand Co., Saginaw, produced molding sand.

**Missaukee.**—C. Stanley Hooker, Cadillac, produced marl for agricultural uses from a site near Lake City. Natural gas and petroleum were produced. The Michigan State Highway Department contracted for road gravel.

**Monroe.**—Clay used in the manufacture of pottery and stoneware was produced by F. W. Ritter Sons Co., South Rockwood. Petroleum was produced. Limestone for concrete aggregate was produced from a quarry near Monroe by The France Stone Co., Toledo, Ohio; The Michigan Stone Co., Ottawa Lake; and the county road commission. The France Stone Co. also produced limestone for flux, agricultural purposes, and railroad ballast.

**Montcalm.**—Natural gas and petroleum were produced. Production of gravel for road construction was reported by The Taber Co., Grand Rapids; A. L. Dyer & Sons, McBrides; Frank H. Stoerk, Pierson; Paul C. Miller, Sparta; and the county road commission. The county road commission also produced road sand.

**Montmorency.**—The county road commission produced sand and gravel for road construction.

**Muskegon.**—Natural gas and petroleum were produced. Hooker Electrochemical Co. (Montague) produced salt used in manufacturing chlorine and other chemicals. Production of molding sand was reported by Nugent Sand Co., Inc. (Muskegon) and Sand Products Corp. (Detroit), which operated a plant at Muskegon. Nugent Sand Co., Inc., also produced engine sand.

**Newaygo.**—Natural gas and petroleum were produced. Producers reporting output of road gravel in the county were Harry Pickitt (Allegan) and Paul C. Miller (Sparta). The Michigan State Highway Department contracted for road gravel.

**Oakland.**—Over 7 million tons of sand and gravel was produced for building, road construction, railroad ballast, and other uses. Producers that reported output in the county were Foley & Beardslee, Clarkston; White Lake Gravel, Inc., Clawson; The Benjamin Pit, Farmington; Groveland Gravel Co., Holly Sand & Gravel Co., and Koan Gravel Co., all of Holly; A. S. Leffler Gravel Co., Davison, from a site near Holly; John R. Sand & Gravel Co., Lake Orion; New Hudson Sand & Gravel and Lyle J. Walker Sand & Gravel, both of New Hudson; Mickelson Bros., Oxford; Koenig Coal & Supply Co., Detroit, and American Aggregates Corp., Greenville, Ohio, both from sites near Oxford; Floyd Beardslee, Pontiac; Underwood Sand & Gravel Co., Utica, from a site near Pontiac; Kemler Bros., Rochester; Paul C. Miller, Sparta; O. E. Gooding & Co., Ypsilanti; and the county

Digitized by Google

road commission. Sand and gravel for road construction was contracted for by the Michigan State Highway Department and the Detroit Department of Public Works. Petroleum was also produced in Oakland County.

**Oceana.**—Petroleum and natural gas were produced. Production of gravel for road construction was reported by Paul C. Miller (Sparta) and West Shore Construction Co. (Zeeland).

**Ogemaw.**—Gravel for road construction was produced from the Walter Rosevear pit, West Branch. The county road commission produced road sand and gravel. The Michigan State Highway Department contracted for road sand. Petroleum was produced.

**Ontonagon.**—Copper ore was produced by White Pine Copper Co. (White Pine), from which copper and some byproduct silver were recovered. In 1956—the first full year of operation—the White Pine mine produced nearly 4 million tons of ore, about a third more than in 1955. The mill operated 24 hours a day on a 7-day-week basis and treated about the same tonnage of ore as was produced at the mine. Near the end of the year 2 rod mills were being installed, and it was estimated that daily rated mill capacity would be increased by approximately 16 percent. The working faces in the mine became more and more distant from the underground crushing plant as the year progressed, with an increasing burden on trucks and personnel of longer hauls. Because of the increasing length of haul a system of lateral belts was designed and at year-end these belts were being installed to reduce the trucking problem.

The Algomah Mining Co. (Ontonagon) continued developing a copper property 17 miles east of Ontonagon.

Road gravel was produced by Mid-America Engineering Corp. (Skokie, Ill.) from a site near Silver City. The Michigan State Highway Department contracted for road gravel.

**Osceola.**—C. Stanley Hooker (Cadillac) produced marl for agricultural uses from pits near Evart, McBain, and Tustin. Natural gas and petroleum were produced. Gravel for road construction was produced by The Wallace Stone Co., Bay Port, from a site near Hersey; The Taber Co., Grand Rapids; and Paul C. Miller, Sparta. The Wallace Stone Co. also produced building and road sand. The Michigan State Highway Department contracted for road sand and gravel.

**Oscoda.**—Petroleum was produced. The Michigan State Highway Department contracted for road gravel.

**Otsego.**—Natural gas and petroleum were produced. Sand and gravel was produced for building and road construction by Harry Pickitt, Allegan; Hutchins Sand & Gravel, Gaylord; and the county road commission.

**Ottawa.**—Production of marl for agricultural uses was reported by Ralph Meyers, West Olive. Natural gas and petroleum were produced. Engine and molding sands and sand and gravel for building, road construction, and other uses were produced. Producers that reported sand and gravel operations in the county were Harry Pickitt, Allegan; Thomas F. Johnston and Standard Sand Co., both of Grand Haven; Henry De Went, Hudsonville; West Shore Construction Co., Zeeland; and Construction Aggregates Corp., Chicago, Illinois, who operated from a site near Grand Haven.

Digitized by Google

**Presque Isle.**—Sand and gravel for building, road construction, and railroad ballast was produced by Straits Aggregate & Equipment Corp. (East Tawas) which operated at a site near Millersburg. Harry Pickitt (Allegan) produced road gravel. The Michigan State Highway Department contracted for road gravel. Limestone was produced by Michigan Limestone Division, United States Steel Corp., Detroit, which operated from a site near Rogers City; and Presque Isle Corp., Cleveland, Ohio, operated by Chemstone Corp. Output was crushed for use as flux, concrete aggregate, agricultural stone, and for chemical uses, and in manufacturing cement and lime. Onaway Stone Co. (Onaway) quarried dimension limestone at Onaway. The product was sold for rough and architectural construction, flagging, and rubble.

**Roscommon.**—Natural gas and petroleum were produced. The Michigan State Highway Department contracted for road gravel.

**Saginaw.**—Minco Products Corp. (Saginaw) produced clay for use in foundries and steelworks, fertilizers, insecticides and fungicides, and rotary-drilling mud and for various other purposes. Petroleum was produced.

**St. Clair.**—Peerless Cement Corp. (Detroit) produced portland cement at Port Huron. Two 400-foot kilns were operated. Clay used in manufacturing cement was mined by the company. Salt was refined from artificial brines produced by dissolving rock salt from the Salina formation, by Diamond Crystal Salt Co. (St. Clair) and Morton Salt Co. (Marysville). Salt was sold for table use, food processing, and ice control and for use in a variety of industrial processes. Sand and gravel was produced for building, road construction, and other uses by William Click, Sr., Goodells; Harvey G. Hall and Lakeport Sand & Gravel Co., both of Port Huron; and O. E. Gooding & Co., Ypsilanti. Peat was produced by Michigan Peat, Inc., New York, from a bog near Capac. Natural gas and petroleum were produced.

**St. Joseph.**—F. Leslie Knox (Colon) and Case Bros. (Sherwood), which operated a pit near Colon, produced marl for agricultural purposes. Sand and gravel for building, road construction, and other uses was produced by John G. Yerington, Benton Harbor; Aggregate Processors, Inc., White Pigeon; and the county road commission. The Michigan State Highway Department and the county road commission contracted for road gravel.

**Sanilac.**—Sand and gravel was produced for building and road construction. Producers that operated in Sanilac County were the Charlotte Van Camp Estate, Croswell; Harold Peters, Decker; O. E. Gooding & Co., Ypsilanti; and the county road commission. The Michigan State Highway Department and the county road commission contracted for road gravel.

**Schoolcraft.**—Road sand and gravel was produced by the county road commission. The Michigan State Highway Department contracted for road gravel. Inland Lime & Stone Co. (Manistique), a division of Inland Steel Co., at its Port Inland quarry produced limestone employed for riprap, flux, concrete aggregate, railroad ballast, and agricultural stone; for chemical use in sugar and glass factories and paper mills; for use as asphalt filler and mineral food; and in cement and lime manufacture. This property, one of the

Digitized by Google

largest limestone operations in the State, has produced over 70 million tons of limestone during the past 25 years. Thornton Construction Co., Inc. (Hancock), which operated at a site near Blaney Park, produced limestone for concrete aggregate.

**Shiawassee.**—Clay for heavy clay products was produced by Michigan Vitrified Tile Co., Corunna. Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Shiawassee County were Comstock Construction Co., Bay City, from a site near Henderson; Harry Fuoss and Shenk Gravel Co., both of Durand; Valley Gravel Co., Owosso; and O. E. Gooding & Co., Ypsilanti. The Michigan State Highway Department contracted for road sand and gravel.

**Tuscola.**—Petroleum was produced. Molding sand, and sand and gravel for building, road construction, and other uses, were produced. Producers that reported operations in Tuscola County were Comstock Construction Co., Bay City, from sites near Fostoria and Mayville; Hile Bros., Peterhans Bros., and Chuck Vaughan Gravel & Excavating, all of Caro; C. R. Hunt, Cass City; Great Lakes Foundry Sand Co., Detroit, from dredge operations near Vassar; Bernthel Sand & Gravel Co., Reese; Andersen Sand & Gravel Co. and Saginaw Core Sand Co., both of Saginaw; and the county road commission.

**Van Buren.**—Petroleum was produced. Molding and engine sands were produced by South Haven Sand Co. (Grand Haven), from a site near South Haven. Garrett Sand Co. (South Haven) also produced molding sand. John G. Yerington (Benton Harbor) produced gravel for road construction and other uses.

**Washtenaw.**—Natural gas and petroleum were produced. Sand and gravel was produced for building, road construction, and other uses by Harry Pickitt, Allegan; Killins Gravel Co., Ann Arbor; Dexter Gravel Co., Dexter; O. E. Gooding & Co., Kruse Gravel Pit, Whittaker & Gooding Co., and Youngs Sand & Gravel, all of Ypsilanti; and the county road commission, which also contracted for road gravel.

**Wayne.**—Portland cement was produced by Wyandotte Chemicals Corp. (Wyandotte), a subsidiary of Huron Portland Cement Co.; and portland and masonry cements were produced by Peerless Cement Corp. (Detroit). Clay for use in manufacturing cement, heavy clay products, and lightweight aggregates was produced. Clay producers that operated in Wayne County were Clippert Brick Co., Dearborn; Flat Rock Clay Products Co., Flat Rock; and Light Weight Aggregate Corp., Livonia. Natural gas and petroleum were also produced in the county.

The Solvay Process Division of Allied Chemical & Dye Corp. and International Salt Co. (both of Detroit) and Pennsylvania Salt Manufacturing Co. and Wyandotte Chemicals Corp. (both of Wyandotte) produced salt for use in manufacturing chlorine and soda ash. Other uses included food processing, ice control and many direct and indirect applications in a variety of products and services. The International Salt Co. produced salt by underground mining methods, while the other companies utilized artificial brines produced by dissolving rock salt from the Salina formation.

Glass, molding, and ground sands and sand and gravel for building, road construction, and other uses were also produced in the county. Producers who reported sand and gravel operations in Wayne County

Digitized by Google

were Harry Pickitt, Allegan; W. L. Emery Co., Detroit; Manning & Locklin, Northville Sand & Gravel Co., and Thomson Sand & Gravel, all of Northville; Michigan Silica Co., Rockwood; and Wayne Sand & Gravel Co., Wayne. The Michigan State Highway Department contracted for road sand.

Limestone for riprap and concrete aggregate was produced by Edward Kraemer & Sons (Plain, Wis.) and Michigan Foundation Quarry (Trenton).

**Wexford.**—Sand and gravel was produced for building and road construction by Leo Dunbar and Wexford Gravel Co. (both of Cadillac) and Paul C. Miller (Sparta). The Michigan State Highway Department contracted for road gravel.

Digitized by Google

# The Mineral Industry of Minnesota

by Matthew G. Sikich [1]

MINNESOTA mineral production in 1956 was valued at approximately $501 million—the same as in 1955. Decreases, chiefly in total values of production of iron and manganiferous ores, offset marked increases in portland and masonry cements, lime, manganese ore, sand and gravel, and stone. Other decreases in values below 1955 were reported for abrasive stones, clays, and marl. The total values of gem stones and peat produced in 1956 were slightly greater than in the preceding year.

Minnesota ranked first in the Nation in the production of iron ore and in 1956 supplied 65 percent of the total usable iron ore produced in the United States. However, shipments of iron ore from mines in the State in 1956 decreased 10 percent below 1955, chiefly because of midseason labor strikes. Probably the outstanding event of the Minnesota mineral industry in 1956 was the first full-scale operation of the taconite-processing plant of Reserve Mining Co. at Silver Bay. Pelletized concentrate was first produced at this plant, called the E. W. Davis Works, in the fall of 1955. In March 1956 the company had all units of the plant in full operation. The first cargo of iron ore to be shipped from Silver Bay was loaded April 6, 1956. Over 3.5 million tons of taconite-concentrate pellets was shipped from this port during 1956. Erie Mining Co. continued its major taconite-plant construction program at Hoyt Lakes. By the end of 1956 the project was estimated to be over 75 percent complete. The plant was expected to begin production late in 1957.

Exploratory drilling of copper-nickel mineralization in northern Minnesota by International Nickel Co. was noteworthy. About 40 diamond-drilled holes reportedly were sunk, some as deep as 2,000 feet.[2] Results of the drilling program had not been revealed at the end of 1956.

Production of nonmetals increased 8 percent in total value in 1956, compared with 1955. New alltime highs were recorded in the total values of production of portland cement, lime, sand and gravel, and stone, reflecting high activity in building and road construction.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.
[2] Mining World, March 1956, p. 91.

465877—58——39



Digitized by Google

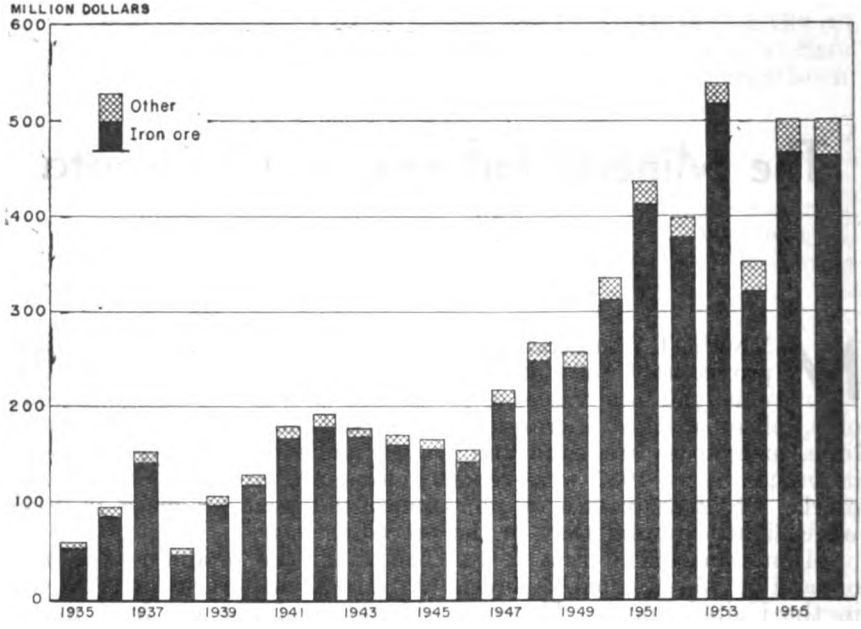



FIGURE 1.—Value of total mineral production and iron-ore shipments, in Minnesota, 1935–56.

**TABLE 1.—Mineral production in Minnesota, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | (2) | (2) | [3] 79,700 | [3] $91,229 |
| Gem stones | (4) | $175 | (4) | 500 |
| Iron ore (usable)..long tons, gross weight | 69,419,334 | 465,169,412 | 62,637,317 | 461,904,029 |
| Manganiferous ore (5 to 35 percent Mn) gross weight | 864,627 | (2) | 633,919 | (2) |
| Sand and gravel | 25,896,426 | 17,429,334 | 28,196,892 | 18,254,301 |
| Stone [5] | 3,004,521 | 7,042,840 | 3,084,316 | 7,551,536 |
| Value of items that cannot be disclosed: Abrasive stones (grinding pebbles, tube-mill liners) cement, clays, lime, manganese ore, manganiferous ore, marl (calcareous), peat, and quartzite | | 11,739,266 | | 13,443,071 |
| Total Minnesota [6] | | 501,151,000 | | 501,027,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Incomplete figure—fire clay included with "Items that cannot be disclosed."
[4] Weight not recorded.
[5] Excludes certain stone, value for which is included with "Items that cannot be disclosed."
[6] Total has been adjusted to eliminate duplicating the value of stone.

Digitized by Google

## REVIEW BY MINERAL COMMODITIES

### METALS

**Iron Ore.**—Shipments of usable iron ore from Minnesota mines in 1956 totaled 62.6 million long tons and composed 92 percent of the total value of mineral production of the State. A 34-day labor strike in the steel industry, which began July 1, and a subsequent 5-week strike of licensed officers on a large part of the Great Lakes ore-carrier fleet were the chief reasons for the 6.8-million-ton decrease in shipments below the tonnage shipped in 1955. However, loss in output during these strikes was reduced considerably by increased production during the operating period and extension of the Lake-shipping season to December 19.

Direct-shipping grades constituted 56 percent of the total usable iron ore shipped from the State in 1956, compared with 63 percent in 1955. An interesting fact, indicating the trend in beneficiation of Minnesota low-grade ores, is that in the decade 1947–56 the proportion of beneficiated to total usable ore shipped from the State rose from 23.5 percent to 43.5. Nearly 63 percent of the 94.5 million tons of crude ore mined in Minnesota in 1956 was sent to beneficiation plants for treatment. Open-pit mines supplied 98 percent of the crude ore mined in the State in 1956.

Mines were operated by 27 companies in Crow Wing, Fillmore, Itasca, and St. Louis Counties. Shipments from the Mesabi range (in Itasca and St. Louis Counties) constituted 94 percent of the total shipments of usable iron ore from Minnesota in 1956. Mines in the Cuyuna range in Crow Wing County, the Vermilion range in St. Louis County, and the Spring Valley district in Fillmore County supplied the remainder.

The highlight of the iron-ore industry in the State in 1956 was the beginning of full-scale operations at the E. W. Davis Works—the taconite-concentrating plant of Reserve Mining Co., owned jointly by Armco Steel Corp. and Republic Steel Corp. The plant, at Silver Bay in Lake County, is approximately 50 miles northeast of Duluth on Lake Superior. Contracts for construction of the plant, considered to be the first large-scale taconite-processing plant in the world, were let in 1951. The first of 12 concentrating units went into operation in October 1955, and all units were ready for production early in 1956. The first shipment of taconite-concentrate pellets produced at the plant was at the beginning of the 1956 navigation season. In 1956 the plant was operated at a rate slightly greater than the initial rated annual capacity—3.75 million tons of finished product. The ultimate annual capacity of the plant was to be 10 million tons, which would require mining approximately 30 million tons of taconite each year. The taconite mine of Reserve Mining Co. is near Babbitt, 47 miles inland from Silver Bay in the eastern end of the Mesabi range. There the taconite was mined and crushed in 2 stages to minus-3-inch size. Most of the crushed material was then shipped over the company interdepartment railroad to the E. W. Davis Works for further processing. Some of the material was concentrated and pelletized at the Babbitt plant, which the company has operated since 1952. The yearly capacity of the Babbitt plant is 300,000 tons of pellets. The ore body at Babbitt

Digitized by Google

was estimated to contain at least 1.5 billion tons of magnetic taconite containing 25 to 30 percent iron, which when processed would yield 500 million tons of concentrate averaging approximately 62 percent iron.

Erie Mining Co., with Pickands Mather & Co. as operating agent, continued constructing its large-scale taconite plant about 5 miles northeast of Aurora. This plant, with an initial rated annual capacity of 7.5 million tons of finished product, was to be the largest concentrator ever built as a single initial unit. Other phases of Erie's vast $300-million taconite project included construction of harbor, dock, and power facilities at Taconite Harbor, the shipping point on Lake Superior; a complete new town of Hoyt Lakes near the plant site; a 73-mile railroad connecting the plant with the harbor; and development of 2 open-pit mines near the concentrating plant, which were to supply the raw material for the plant. Erie Mining Co. had been producing taconite-concentrate pellets at its preliminary plant near Aurora since 1948. The annual capacity of this plant was about 200,000 tons of pellets. The company was expected to begin production at the large-scale plant late in 1957.

Oliver Iron Mining Division of United States Steel Corp. continued to produce taconite concentrate in 1956 at its Pilotac plant near Mountain Iron. Concentrate produced at this plant was agglomerated at the company Extaca plant at Virginia.

Stripping was under way during 1956 at several new mines, including the Stephens mine near Aurora, operated by Oliver Iron Mining Division and considered the largest undeveloped reserve of direct-shipping ore in the Mesabi range. Several new ore-treatment plants were put into operation or were being constructed at various points in the iron ranges.

According to company reports, all iron ore shipped from Minnesota mines in 1956 was for use in furnaces manufacturing pig iron and steel. Occasionally in past years, however, small quantities of crude iron ore have been sold for use in manufacturing iron oxide pigments.

Effective January 1, 1956, and throughout 1956, Lake Erie base prices for iron ore were: High Phosphorus, $10.85 per ton; Mesabi Non-Bessemer, $10.85; Mesabi Bessemer, $11.00; Old Range Non-Bessemer, $11.10; Old Range Bessemer, $11.25; and Open-Hearth Lump, $12.10. These prices were for ore delivered at lower Lake ports and were based on the following guaranteed-base analyses: Non-Bessemer grades, 51.50 percent iron (natural); and Bessemer grades, 51.50 percent iron (natural) and 0.045 percent phosphorus (dry). Premiums and penalties were applied for variations in analyses and physical structure. Most of the tonnage shipped from the State during 1956 was of non-Bessemer grades. In 1956 the average weighted value at the mine for Minnesota iron-ore shipments, as reported by producing companies, was $7.37 per long ton compared with $6.70 in 1955.

The 1956 navigation season for Minnesota ore shipments opened April 5 at the Great Northern Railway Co. docks at Superior, Wis. Heavy demand for iron ore at steel plants, which had been operating at near capacity during the winter, was the primary reason for the early opening. Weather conditions were favorable during the year,

Digitized by Google

**TABLE 2.—Dates of first and final cargoes of iron ore at United States upper Lake ports, 1954–56 [1]**

| Port and dock | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|
| | First | Final | First | Final | First | Final |
| Ashland, Wis.: | | | | | | |
| C&NW | May 2 | Nov. 16 | Apr. 24 | Nov. 20 | Apr. 25 | Nov. 28 |
| Soo Line | Apr. 24 | Nov. 10 | Apr. 24 | Nov. 28 | Apr. 23 | Nov. 25 |
| Duluth, Minn.: DM&IR | Apr. 21 | Oct. 26 | Apr. 13 | Nov. 26 | Apr. 8 | Dec. 15 |
| Escanaba, Mich.: C&NW | Apr. 19 | Dec. 2 | Apr. 7 | Dec. 8 | Apr. 7 | Dec. 3 |
| Marquette, Mich.: | | | | | | |
| DSS&A | Apr. 30 | Oct. 30 | Apr. 22 | Nov. 13 | Apr. 26 | Nov. 11 |
| LS&I | Apr. 28 | Nov. 28 | Apr. 18 | Dec. 3 | Apr. 9 | Dec. 5 |
| Silver Bay, Minn.: Reserve | | | | | Apr. 6 | Dec. 14 |
| Superior, Wis.: | | | | | | |
| G. N | Apr. 22 | Nov. 29 | Apr. 14 | Dec. 3 | Apr. 5 | Dec. 8 |
| NP-Soo Line | Apr. 20 | Nov. 26 | Apr. 21 | Nov. 26 | Apr. 8 | Nov. 25 |
| Two Harbors, Minn.: DM&IR | Apr. 19 | Nov. 18 | Apr. 13 | Nov. 26 | Apr. 8 | Dec. 19 |

[1] Source: Skillings' Mining Review, Dec. 29, 1956, p. 6.

**TABLE 3.—Total usable iron ore produced (direct-shipping, concentrate, and sinter), 1884–1956, by ranges, in long tons [1]**

| Year | Cuyuna | Mesabi | Vermilion | Spring Valley district | Total |
|---|---|---|---|---|---|
| 1884–1943 | 31,390,054 | 1,314,036,795 | 74,237,762 | 279,645 | 1,419,944,256 |
| 1944 | 1,417,256 | 61,994,023 | 1,466,816 | | 64,878,095 |
| 1945 | 1,784,010 | 58,355,320 | 1,481,007 | | 61,620,337 |
| 1946 | 1,380,120 | 46,678,679 | 1,232,008 | | 49,290,807 |
| 1947 | 2,100,846 | 58,772,404 | 1,471,879 | 147,787 | 62,492,916 |
| 1948 | 2,030,281 | 64,071,983 | 1,580,497 | 352,979 | 68,035,740 |
| 1949 | 1,826,711 | 52,551,346 | 1,381,327 | 102,158 | 55,861,542 |
| 1950 | 2,480,843 | 60,838,025 | 1,580,217 | 335,470 | 65,234,555 |
| 1951 | 2,651,724 | 73,574,908 | 1,806,818 | 452,405 | 78,485,855 |
| 1952 | 2,369,180 | 59,370,538 | 1,573,748 | 476,242 | 63,789,708 |
| 1953 | 2,900,579 | 75,324,236 | 1,643,039 | 217,760 | 80,085,614 |
| 1954 | 1,497,296 | 45,724,827 | 1,371,967 | 157,681 | 48,751,771 |
| 1955 | 2,770,738 | 64,860,493 | 1,454,365 | 270,670 | 69,356,266 |
| 1956 | 2,242,216 | 59,346,091 | 1,284,536 | 349,568 | 63,222,411 |
| Total | 58,841,854 | 2,095,499,668 | 93,565,986 | 3,142,365 | 2,251,049,873 |

[1] Exclusive after 1905 of iron ore containing 5 percent or more manganese.

**TABLE 4.—Production, shipments, and stocks of usable iron ore in 1956, by counties and ranges, in long tons [1]**

| County or range | Stocks Jan. 1, 1956 | Production | Shipments | Stocks Dec. 31, 1956 | Iron content of production (in long tons) |
|---|---|---|---|---|---|
| County: | | | | | |
| Crow Wing | 115,017 | 2,242,216 | 2,236,150 | 121,083 | 1,122,664 |
| Fillmore | | 349,568 | 349,568 | | 165,238 |
| Itasca | [2] 731,461 | 15,677,918 | 15,236,391 | 1,172,988 | 8,184,934 |
| St. Louis | [2] 842,005 | 44,952,709 | 44,815,208 | 979,506 | 23,081,304 |
| Total | [2] 1,688,483 | 63,222,411 | 62,637,317 | 2,273.577 | 32,554,140 |
| Range: | | | | | |
| Cuyuna | 115,017 | 2,242,216 | 2,236,150 | 121,083 | 1,122,664 |
| Mesabi | [2] 1,365,293 | 59,346,091 | 58,689,660 | 2,021,724 | 30,545,832 |
| Vermilion | 208,173 | 1,284,536 | 1,361,939 | 130,770 | 720,406 |
| Spring Valley district (Fillmore County) | | 349,568 | 349,568 | | 165,238 |
| Total | [2] 1,688,483 | 63,222,411 | 62,637,317 | 2,273,577 | 32,554,140 |

[1] Exclusive of ore containing 5 percent or more manganese.
[2] Revised figure.

Digitized by Google

**TABLE 5.—Production, shipments, and stocks of crude ore, in 1956, by counties and ranges, in long tons [1]**

| County or range | Stocks Jan. 1, 1956 | Production | | Shipments | | Stocks Dec. 31, 1956 |
|---|---|---|---|---|---|---|
| | | Underground | Open pit | Direct to consumers | To beneficiation plants | |
| County: | | | | | | |
| Crow Wing | 31,812 | 282,196 | 2,713,907 | 1,053,672 | 1,943,422 | 30,821 |
| Fillmore | ---------- | ---------- | 502,295 | ---------- | 502,295 | ---------- |
| Itasca | 38,088 | ---------- | 32,769,030 | 995,561 | 31,811,557 | ---------- |
| St. Louis | [2] 882,270 | 1,891,882 | 56,353,064 | 33,330,878 | 25,168,006 | 628,332 |
| Total | [2] 952,170 | 2,174,078 | 92,338,296 | 35,380,111 | 59,425,280 | 659,153 |
| Range: | | | | | | |
| Cuyuna | 31,812 | 282,196 | 2,713,907 | 1,053,672 | 1,943,422 | 30,821 |
| Mesabi | [2] 712,185 | 607,346 | 89,122,094 | 32,964,500 | 56,979,563 | 497,562 |
| Vermilion | 208,173 | 1,284,536 | ---------- | 1,361,939 | ---------- | 130,770 |
| Spring Valley district (Fillmore County) | ---------- | ---------- | 502,295 | ---------- | 502,295 | ---------- |
| Total | [2] 952,170 | 2,174,078 | 92,338,296 | 35,380,111 | 59,425,280 | 659,153 |

[1] Exclusive of ore containing 5 percent or more manganese.
[2] Revised figure.

**TABLE 6.—Salient statistics of iron ore shipped from mines 1947–56, in long tons [1]**

| Year | Crude ore to concentrators | Beneficiated | | | Total usable ore [2] | Proportion of beneficiated to total usable ore (percent) |
|---|---|---|---|---|---|---|
| | | Sinter | Other | Total | | |
| 1947 | 26,841,902 | 295,045 | 14,972,344 | 15,267,389 | 62,436,102 | 24.45 |
| 1948 | 28,176,320 | 256,000 | 15,997,641 | 16,253,641 | 67,923,237 | 23.93 |
| 1949 | 24,941,064 | 260,403 | 14,091,248 | 14,351,651 | 55,943,714 | 25.65 |
| 1950 | 36,334,262 | 253,452 | 18,525,065 | 18,778,517 | 64,538,759 | 29.10 |
| 1951 | 43,972,058 | 194,971 | 21,575,427 | 21,770,398 | 78,164,527 | 27.85 |
| 1952 | 36,812,301 | 781,459 | 18,326,238 | 19,107,697 | 63,906,069 | 29.90 |
| 1953 | 49,924,037 | 1,080,413 | 25,097,519 | 26,177,932 | 80,533,670 | 32.51 |
| 1954 | 38,469,805 | 1,335,379 | 17,859,191 | 19,194,570 | 48,613,338 | 39.48 |
| 1955 | 50,733,839 | 1,793,125 | 23,987,939 | 25,781,064 | 69,419,334 | 37.14 |
| 1956 | 59,425,280 | 5,308,990 | 21,948,216 | 27,257,206 | 62,637,317 | 43.52 |

[1] Exclusive of ore containing 5 percent or more manganese.
[2] Direct-shipping and beneficiated ore.

allowing Lake shipping to continue late in the season. The final ore cargo of the 1956 season left Two Harbors December 19, bringing to a close one of the longest shipping seasons on record.

Nearly 95 percent of the usable iron-ore shipments from Minnesota mines in 1956 was shipped by Lake vessel to lower Lake ports and from thence to consuming districts. The remainder was shipped all rail to the final destination. During 1956 a substantial tonnage of Minnesota ore was consumed at Duluth in blast and steel furnaces operated by Interlake Iron Corp. and the American Steel & Wire Division of United States Steel Corp. Both companies also operated coke ovens at Duluth.

Statistical data for iron ores containing 5 percent or more manganese, natural, are not included with iron-ore data in this chapter but are treated separately as "Manganiferous ore."

**Manganese Ore.**—Manganese carbonate, manganese dioxide, and other manganese products were produced from Cuyuna-range man-

Digitized by Google

ganiferous ores by Manganese Chemicals Corp. at its plant near Riverton. Daily capacity of the plant, which utilizes the Dean-Leute ammonium carbamate leach process, was about 200 long tons of crude-ore input.

**TABLE 7.—Shipments, with average iron and manganese contents, of usable [1] manganiferous iron ore (containing 5 to 10 percent Mn, natural) and ferruginous manganese ore (containing 10 to 35 percent Mn, natural) from mines in the Cuyuna range, 1947–51 (average) and 1952–56, in long tons**

| Year | Manganiferous iron ore | | | Ferruginous manganese ore | | | Total shipments |
|---|---|---|---|---|---|---|---|
| | Shipments | Contents (natural) | | Shipments | Contents (natural) | | |
| | | Fe, percent | Mn, percent | | Fe, percent | Mn, percent | |
| 1947–51 (average) | 905,830 | 36.93 | 6.01 | 6,146 | 32.93 | 11.52 | 911,976 |
| 1952 | 773,260 | 38.40 | 5.77 | 28,127 | 32.38 | 10.61 | 801,387 |
| 1953 | 795,001 | 37.79 | 5.69 | 179,545 | 33.73 | 11.62 | 974,546 |
| 1954 | 443,308 | 40.65 | 5.65 | 6,743 | 30.22 | 10.96 | 450,051 |
| 1955 | 669,056 | 39.63 | 5.90 | 102,933 | 33.47 | 13.15 | 771,989 |
| 1956 | 481,946 | 38.01 | 6.58 | 84,053 | [2] 31.82 | 11.93 | 565,999 |

[1] Direct-shipping and beneficiated ore.
[2] Partly estimated.

**Manganiferous Ore.**—Shipments of manganiferous ore (containing 5 to 35 percent manganese, natural) totaled 633,919 short tons in 1956, a decrease of 27 percent below 1955. The chief reason for the decrease was interruption of operations brought about by the 5-week steel strike in midsummer. However, one producer reported that Cuyuna-range manganiferous ore was very difficult to sell due to competition from Labrador. Shipments were reported from seven open-pit mines—all in Crow Wing County in the Cuyuna range. Operators in 1956 were Hanna Coal & Ore Corp., Pickands Mather & Co., and Zontelli Bros., Inc.

Total shipments in 1956 consisted of 336,371 short tons of direct-shipping grades and 297,548 short tons of concentrate. Nearly 72 percent of the 1,186,000 short tons of crude manganiferous ore mined was beneficiated by washing, jigging, and dense-medium processes. Manganiferous iron ore (containing 5 to 10 percent manganese, natural) constituted 85 percent of the total shipments, and ferruginous manganese ore (containing from 10 to 35 percent manganese, natural) composed the remainder. Average manganese content of the total shipments in 1956 was 7.37 percent compared with 6.87 percent in 1955.

Over 99 percent of the manganiferous ore shipped from Minnesota to date has come from mines in the Cuyuna range. Last recorded shipments from the Mesabi range were in 1952; from the Vermilion range, in 1917.

Ores containing over 5 percent natural manganese generally have been priced as Old Range Non-Bessemer on their combined natural iron and manganese content, plus a premium for the natural manganese in excess of 5 percent.

Digitized by Google

Most of the ore shipped in 1956 was for use in blast furnaces. Some was sold to Manganese Chemicals Corp., which processed the material at its plant near Riverton.

The estimated tonnage of manganese-bearing material on the Cuyuna range was approximately 500 million tons, averaging about 5 percent manganese. The Federal Bureau of Mines continued research at its Minneapolis Station on utilization of low-grade domestic manganese resources, including studies on a sulfur dioxide-air roast process for beneficiating the low-grade manganiferous carbonate slates of the Cuyuna range.

## NONMETALS

**Abrasives.**—The Jasper Stone Co. produced grinding pebbles and tube-mill liners from a quartzite deposit near Jasper, Rock County. Total output in 1956 was slightly lower than in 1955. However, demand for the products was fairly good. Sales were chiefly to cement, ceramic, and silica sand producers. Only 5 States in the Nation produced grinding pebbles, and 3 produced tube-mill liners in 1956.

**Cement.**—Portland and masonry cements were produced by Universal Atlas Cement Co., which operated the only cement plant in the State at Duluth. Shipments in 1956 increased over the previous year, keeping pace with the level of regional construction activity. Portland-cement output consisted of types I and II (general use and moderate heat). Masonry cement was marketed under the name of Atlas Mortar. Average mill values per barrel of both portland and masonry cements in 1956 increased over 1955. Cements were shipped from the plant by rail and truck in bulk and in paper-bag containers. Raw materials used in 1956 were principally gypsum, limestone, sand, slag, and iron dust.

**Clays.**—Fire clay and miscellaneous clay were produced in Minnesota in 1956 chiefly for the manufacture of pottery, floor and wall tile, and heavy clay products, such as building brick, drain tile, and sewer pipe. The total quantity sold or used was 5 percent greater than in 1955; the total value, however, decreased slightly. Output was credited to seven companies, with operations in Beltrami, Brown, Carlton, Goodhue, Polk, and Ramsey Counties.

**Gem Stones.**—A small quantity of semiprecious gem stones was collected by several hobbyists along the north shore of Lake Superior and in the southeastern part of the State in Winona County. The material collected was chiefly agate and thomsonite. Gem materials were not explored for in the State on a commercial basis, but as a hobby by amateurs. Semiprecious gem materials were used primarily for personal gem collections and handmade jewelry.

**Lime.**—Cutler-Magner Co. was the only lime producer in Minnesota in 1956. The company operated a plant at Duluth and reported shipments of quick and hydrated lime. Although the total value of sales increased over 1955, the quantity sold decreased slightly. The output was chiefly consumed for building, agricultural, industrial, and chemical uses.

**Marl.**—Calcareous marl production in 1956 decreased both in quantity and total value below that in 1955, chiefly as a result of

Digitized by Google

lower demand. Output, reported by two companies in Chisago and Crow Wing Counties, was used entirely for agricultural purposes.

**Perlite.**—Crude perlite produced in Colorado and Nevada was expanded at plants operated by Minnesota Perlite Corp. and Western Mineral Products Co. in Minneapolis. The expanded material was used as lightweight aggregate in plaster and concrete and for other purposes.

**Sand and Gravel.**—Production of sand and gravel was reported from every county in the State in 1956. The total output in 1956 was approximately 28 million short tons, establishing a new alltime high; this was a 9-percent increase over the quantity produced in 1955, the previous record year. Chief reason for the increase was the intensive building- and road-construction activity in the State. Counties from

**TABLE 8.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| Class of operation and use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Glass | 5,795 | $39,822 | $6.87 | 20,332 | $83,026 | $4.08 |
| Building | 3,387,806 | 2,802,358 | .83 | 3,335,880 | 2,771,103 | .83 |
| Paving | 806,919 | 632,736 | .78 | 1,228,132 | 746,262 | .61 |
| Railroad ballast | (1) | (1) | (1) | 6,300 | 3,568 | .57 |
| Other | 89,004 | 245,013 | 2.75 | 220,132 | 464,601 | 2.11 |
| Undistributed [2] | 76,019 | 152,778 | 2.01 | 43,330 | 73,285 | 1.69 |
| Total | 4,365,543 | 3,872,707 | .89 | 4,854,106 | 4,141,845 | .85 |
| Gravel: | | | | | | |
| Building | 2,226,484 | 3,258,073 | 1.46 | 2,430,843 | 3,558,361 | 1.46 |
| Paving | 4,300,762 | 3,223,247 | .75 | 4,292,588 | 2,822,249 | .66 |
| Railroad ballast | 890,572 | 362,475 | .41 | 1,366,553 | 604,865 | .44 |
| Other | 178,260 | 35,714 | .20 | 379,094 | 212,364 | .56 |
| Total | 7,596,078 | 6,879,509 | .91 | 8,469,078 | 7,197,839 | .85 |
| Total sand and gravel | 11,961,621 | 10,752,216 | .90 | 13,323,184 | 11,339,684 | .85 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 4,050 | 1,215 | .30 | 4,050 | 1,215 | .30 |
| Paving | 110,172 | 40,913 | .37 | 344,125 | 112,883 | .33 |
| Total | 114,222 | 42,128 | .37 | 348,175 | 114,098 | .33 |
| Gravel: | | | | | | |
| Building | 3,517 | 1,055 | .30 | 70,000 | 21,000 | .30 |
| Paving | 13,817,066 | 6,633,935 | .48 | 14,455,533 | 6,779,519 | .47 |
| Total | 13,820,583 | 6,634,990 | .48 | 14,525,533 | 6,800,519 | .47 |
| Total sand and gravel | 13,934,805 | 6,677,118 | .48 | 14,873,708 | 6,914,617 | .46 |
| ALL OPERATIONS | | | | | | |
| Sand | 4,479,765 | 3,914,835 | .87 | 5,202,281 | 4,255,943 | .82 |
| Gravel | 21,416,661 | 13,514,499 | .63 | 22,994,611 | 13,998,358 | .61 |
| Grand total | 25,896,426 | 17,429,334 | .67 | 28,196,892 | 18,254,301 | .65 |

[1] Figures withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[2] Includes railroad-ballast sand (1955) and foundry, engine, and molding sands (1955–56) to avoid disclosing individual company confidential data.

Digitized by Google

which over 1 million tons were produced in 1956 were Hennepin, St. Louis, Stearns, and Washington.

Of the quantity produced in 1956, nearly 93 percent was for building and paving use. Approximately 5 percent was for railroad ballast. Smaller quantities of special types of sands were consumed for molding, engine use, and the manufacture of glass. About 47 percent of the total output was produced at commercial operations and the remaining 53 percent at Government-and-contractor operations. Methods of transportation to consumers consisted chiefly of truck and rail haulage, with truck shipments composing 91 percent of the total.

The 10 leading commercial producers in 1956 were: Anderson Aggregates, Barton Contracting Co., Chas. M. Freidheim & Co., and Industrial Aggregates Co., all of Minneapolis; Becker County Sand & Gravel Co. and Hallett Construction Co., Crosby; Cemstone Products Co. and J. L. Shiely Co., St. Paul; Silica Sand Corp., Le Sueur; and Ulland Bros., Inc., Austin.

**Stone.**—Total production of stone in Minnesota in 1956 increased 3 percent over that in 1955 and established a new record high, surpassing the previous high set in 1955. Stone products included granite, limestone, basalt, and quartzite.

Output of granite in the State in 1956 increased 8 percent over the previous year. Granite quarries were operated in three widely

**TABLE 9.—Granite sold or used by producers in 1955–56, by uses**

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Quantity | Value | | Quantity | Value | |
| | | Total | Average per unit of measure | | Total | Average per unit of measure |
| Dimension: | | | | | | |
| Rough construction: | | | | | | |
| Commercial ....short tons.. | 581 | $6,000 | $10.33 | ---------- | ---------- | ---------- |
| Noncommercial....do.... | 249 | 6,000 | 24.09 | ---------- | ---------- | ---------- |
| Rubble: | | | | | | |
| Commercial....do.... | 46,838 | 27,279 | .58 | 24,665 | $15,610 | $0.63 |
| Noncommercial....do.... | ---------- | ---------- | ---------- | 5,200 | 26,000 | 5.00 |
| Rough architectural...cubic feet.. | [1] 117,281 | [1] 1,110,110 | [1] 9.47 | [1] 149,492 | [1] 1,654,009 | [1] 11.06 |
| Rough monumental....do.... | 41,924 | 191,708 | 4.57 | 57,089 | 217,015 | 3.80 |
| Dressed architectural....do.... | (1) | (1) | (1) | (1) | (1) | (1) |
| Dressed monumental....do.... | 109,411 | 1,184,195 | 10.82 | 79,151 | 1,014,176 | 12.81 |
| Total dimension equivalent short tons [2].. | 69,963 | 2,525,292 | 36.09 | 53,581 | 2,926,810 | 54.62 |
| Crushed and broken: | | | | | | |
| Riprap: | | | | | | |
| Commercial....short tons.. | (3) | (3) | (3) | 12,084 | 10,288 | .85 |
| Noncommercial....do.... | ---------- | ---------- | ---------- | 1,800 | 700 | .39 |
| Concrete aggregate and roadstone short tons.. | (3) | (3) | (3) | (3) | (3) | (3) |
| Railroad ballast....do.... | 432,962 | 475,474 | 1.10 | (3) | (3) | (3) |
| Other....do.... | [3] 143,605 | [3] 347,650 | [3] 2.42 | [3] 630,002 | [3] 806,761 | [3] 1.28 |
| Total crushed and broken..do.... | 576,567 | 823,124 | 1.43 | 643,886 | 817,749 | 1.27 |
| Grand total....do.... | 646,530 | 3,348,416 | 5.18 | 697,467 | 3,744,559 | 5.37 |

[1] Figures for dressed and rough architectural use are combined to avoid disclosing individual company confidential data.
[2] Average weight of 166 pounds per cubic foot used to convert cubic feet to short tons.
[3] Figures for riprap (1955), concrete aggregate and roadstone 1955–56, and railroad ballast (1956) are combined with "Other" to avoid disclosing individual company confidential data.

Digitized by Google

separated regions—Central Minnesota in Kanabec, Mille Lacs, and Stearns Counties; the upper Minnesota River Valley in Big Stone, Chippewa, Lac qui Parle, Redwood, Renville, and Yellow Medicine Counties; and the northeastern part of the State, in St. Louis County. Finishing plants were operated in Cold Spring, Delano, and St. Cloud. Dimension granite was produced chiefly for building and monumental purposes. Output of crushed and broken granite was used for riprap, concrete aggregate and roadstone, railroad ballast, and other applications.

TABLE 10.—Crushed and broken limestone sold or used by producers in 1955–56, by uses

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average |
| Crushed and broken: | | | | | | |
| Riprap | 60,468 | $97,160 | $1.61 | 83,511 | $94,353 | $1.13 |
| Flux | 425 | 1,500 | 3.53 | 250 | 883 | 3.53 |
| Concrete aggregate and roadstone: | | | | | | |
| Commercial | 1,823,786 | 1,984,493 | 1.09 | 1,909,287 | 2,058,947 | 1.08 |
| Noncommercial | 166,132 | 169,972 | 1.02 | 45,297 | 45,642 | 1.01 |
| Railroad ballast | 2,381 | 4,919 | 2.07 | 5,530 | 8,140 | 1.47 |
| Agriculture | 235,014 | 335,674 | 1.43 | 223,708 | 329,109 | 1.47 |
| Other uses | 42,835 | 197,233 | 4.60 | 42,038 | 196,712 | 4.68 |
| Total | 2,331,041 | 2,790,951 | 1.20 | 2,309,621 | 2,733,786 | 1.18 |

Limestone was produced in 1956 chiefly from deposits along the Minnesota and Mississippi Rivers in the eastern and south central part of the State. This total output decreased below 1955. Most of the crushed limestone produced was crushed for use as concrete aggregate, roadstone, and agricultural stone. Small quantities of crushed or broken limestone were used for railroad ballast, riprap, flux, and other purposes. Dimension limestone for building and architectural use and flagging totaled 27,228 short tons valued at $973,193 in 1956.

The Zenith Dredge Co. produced crushed basalt for concrete aggregate and roadstone in St. Louis County.

Waste material resulting from the production of grinding pebbles and tube-mill liners from a quartzite quarry near Jasper in Rock County was sold for use as riprap.

**Vermiculite.**—Crude vermiculite produced in Montana was exfoliated at plants in Minneapolis and St. Paul. Major uses of the exfoliated product were in the construction industry, as insulating material, and as lightweight aggregate in plaster and concrete.

## MINERAL FUELS

**Peat.**—The quantity of peat produced in Minnesota in 1956 increased over that in 1955. Output was reported by only one producer from a bog in Aitkin County. Although classed as a fuel, peat was used chiefly for horticultural purposes. Minnesota contains about half the United States reserves of peat. Under the sponsorship of

Digitized by Google

the Minnesota Iron Range Resources and Rehabilitation Commission, research work has continued to develop methods of utilizing the vast peat resource of the State. Emphasis has been placed on developing chemical products from peat.

## REVIEW BY COUNTIES

**Aitkin.**—Moss peat was produced by the Colby Pioneer Peat Co. of Hanlontown, Iowa, from a bog near Floodwood. Material was processed at a plant in Wawina, Itasca County and sold for horticultural purposes.

Road gravel was produced by and for the Minnesota Highway Department.

**Anoka.**—Charles Weaver Sons, Inc., operated a portable plant near Anoka and produced gravel for miscellaneous uses. The county highway department produced sand for road use.

**Becker.**—Sand and gravel for building and road construction, engine use, railroad ballast, and other purposes was produced by Becker County Sand & Gravel Co. Road gravel was produced by and for the State and county highway departments.

**Beltrami.**—Ritchie & Tell operated a fixed plant near Bemidji and produced sand and gravel for building and road purposes. Melvin Samuelson reported output of sand and gravel for road use from a pit near Kelliher. The State and county highway departments produced and contracted for sand and gravel for road use. The Bemidji Brick Co. produced clay for manufacturing heavy clay products.

**Benton.**—Road gravel was produced by Ahles & Lush, by the county highway department, and by and for the Minnesota Highway Department.

**TABLE 11.—Value of mineral production in Minnesota, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Aitkin | (1) | (1) | Sand and gravel, peat. |
| Anoka | (1) | $13,500 | Sand and gravel. |
| Becker | (1) | 263,694 | Do. |
| Beltrami | $68,763 | 106,726 | Sand and gravel, clays. |
| Benton | 12,523 | 39,706 | Sand and gravel. |
| Big Stone | (1) | (1) | Stone, sand and gravel. |
| Blue Earth | 465,708 | 547,510 | Sand and gravel, stone. |
| Brown | 104,324 | 325,156 | Sand and gravel, clays. |
| Carlton | 159,264 | 201,949 | Do. |
| Carver | (1) | (1) | Sand and gravel. |
| Cass | 84,151 | 49,534 | Do. |
| Chippewa | 113,950 | 271,357 | Sand and gravel, stone. |
| Chisago | 44,754 | 47,969 | Sand and gravel, marl. |
| Clay | 244,273 | 337,364 | Sand and gravel. |
| Clearwater | | 8,693 | Do. |
| Cook | 10,602 | 2,888 | Do. |
| Cottonwood | 110,982 | 125,992 | Do. |
| Crow Wing | 23,906,927 | 21,909,552 | Iron ore, manganiferous ore, synthetic manganese ore, sand and gravel, marl. |
| Dakota | 455,197 | 606,216 | Stone, sand and gravel. |
| Dodge | (1) | 86,632 | Sand and gravel, stone. |
| Douglas | 57,783 | 101,756 | Sand and gravel. |
| Faribault | 268,319 | (1) | Do. |
| Fillmore | 2,110,190 | (1) | Iron ore, stone, sand and gravel. |
| Freeborn | 138,297 | 171,823 | Sand and gravel. |
| Goodhue | 172,803 | 342,378 | Stone, sand and gravel, clays. |
| Grant | 45,386 | 137,720 | Sand and gravel. |

[1] Figure withheld to avoid disclosing individual company confidential data; value included with "Undistributed."

Digitized by Google

**TABLE 11.—Value of mineral production in Minnesota, 1954–55, by counties—Continued**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Hennepin | $3,256,245 | $3,074,647 | Sand and gravel, stone. |
| Houston | 146,688 | 113,622 | Stone, sand and gravel. |
| Hubbard | | 163,195 | Sand and gravel. |
| Isanti | 7,036 | 21,962 | Do. |
| Itasca | 114,092,412 | 117,965,312 | Iron ore, sand and gravel. |
| Jackson | 92,114 | 126,595 | Sand and gravel. |
| Kanabec | (1) | 69,716 | Sand and gravel, stone. |
| Kandiyohi | 292,025 | 384,655 | Sand and gravel. |
| Kittson | 176,685 | 90,618 | Do. |
| Koochiching | 1,094 | 129,561 | Do. |
| Lac qui Parle | 250,994 | 731,535 | Stone, sand and gravel. |
| Lake | 19,218 | 25,662 | Sand and gravel, gem stones. |
| Lake of the Woods | 14,300 | 16,287 | Sand and gravel. |
| Le Sueur | 1,009,322 | 1,300,649 | Stone, sand and gravel. |
| Lincoln | 63,899 | 40,973 | Sand and gravel. |
| Lyon | 115,052 | 64,868 | Do. |
| McLeod | 72,397 | 51,764 | Do. |
| Mahnomen | 12,407 | 113,685 | Do. |
| Marshall | 12,226 | 229,683 | Do. |
| Martin | 22,635 | 45,051 | Do. |
| Meeker | (1) | 104,761 | Do. |
| Mille Lacs | 426,278 | (1) | Stone, sand and gravel. |
| Morrison | 31,496 | 123,354 | Sand and gravel. |
| Mower | 131,615 | 104,673 | Sand and gravel, stone. |
| Murray | (1) | 20,782 | Sand and gravel. |
| Nicollet | (1) | 97,236 | Do. |
| Nobles | 108,596 | 125,968 | Do. |
| Norman | | 75,350 | Do. |
| Olmsted | 194,300 | 312,170 | Stone, sand and gravel. |
| Otter Tail | 212,378 | 177,092 | Sand and gravel. |
| Pennington | 13,538 | 23,938 | Do. |
| Pine | 8,035 | 59,833 | Do. |
| Pipestone | 234,865 | 225,804 | Do. |
| Polk | 183,154 | 390,014 | Sand and gravel, clays. |
| Pope | 59,169 | 102,118 | Sand and gravel. |
| Ramsey | 198,093 | 180,907 | Sand and gravel, clays, stone. |
| Red Lake | | 85,307 | Sand and gravel. |
| Redwood | 58,182 | 209,107 | Sand and gravel, stone. |
| Renville | 473,503 | 529,024 | Stone, sand and gravel. |
| Rice | 340,662 | 606,426 | Sand and gravel, stone. |
| Rock | 383,629 | 180,619 | Abrasives, sand and gravel, stone. |
| Roseau | 52,056 | 81,596 | Sand and gravel. |
| St. Louis | 337,483,687 | 334,973,928 | Iron ore, cement, sand and gravel lime, stone. |
| Scott | 505,282 | 649,084 | Stone, sand and gravel. |
| Sherburne | 17,500 | 37,965 | Sand and gravel. |
| Sibley | 1,667 | 63,030 | Do. |
| Stearns | 1,274,603 | 2,273,420 | Stone, sand and gravel. |
| Steele | 201,751 | 363,045 | Sand and gravel, stone. |
| Stevens | | 353 | Sand and gravel. |
| Swift | (1) | 111,478 | Do. |
| Todd | (1) | 176,253 | Do. |
| Traverse | 24,912 | 116,774 | Do. |
| Wabasha | (1) | 156,250 | Sand and gravel, stone. |
| Wadena | (1) | 230,831 | Sand and gravel. |
| Waseca | | (1) | Do. |
| Washington | 1,449,324 | 1,518,949 | Do. |
| Watonwan | 62,680 | 36,022 | Do. |
| Wilkin | 24,114 | 31,495 | Do. |
| Winona | 541,726 | 493,293 | Stone, sand and gravel, gem stones. |
| Wright | 104,756 | 198,705 | Sand and gravel. |
| Yellow Medicine | (1) | 353,269 | Stone, sand and gravel. |
| Undistributed | 8,118,145 | 4,968,772 | |
| Total | 501,151,000 | 501,027,000 | |

[1] Figure withheld to avoid disclosing individual company confidential data; value included with "Undistributed."

**Big Stone.**—Cold Spring Granite Co. operated the Agate quarry near Ortonville, and the Delano Granite Works, Inc., operated a quarry near Odessa. Rough granite from these quarries was processed at plants operated by both companies—one at Cold Spring and the other at Delano. The finished product was used chiefly as architec

Digitized by Google

tural and monumental stone. The State highway department produced and contracted for road gravel.

**Blue Earth.**—Guaranteed Gravel & Sand Co. and Hiniker Sand & Gravel Co. produced sand and gravel for building construction. Hallett Construction Co. produced building sand at a fixed plant at Mankato. Sand and gravel for building and road purposes was produced by North Star Concrete Co., which also operated a fixed plant at Mankato. Ed Swartout reported output of road gravel and crushed limestone for agricultural use. The State highway department produced and contracted for gravel for road construction. T. R. Coughlan Co. produced limestone for road material, riprap and agricultural stone. Agricultural limestone was produced by Mankato Stone Co.

**Brown.**—Sand and gravel for building and road construction was produced in Brown County during the year. Portable plants were operated by Carlson Bros., Inc., and Roberts Bros. near Comfrey and New Ulm, respectively. Fixed plants were operated by Lawrence Wallner near New Ulm and by M. M. Youngmann near Sleepy Eye. Other sand and gravel producers included Math N. Schumacher and the State and county highway departments. Miscellaneous clay for use in manufacturing building brick and other heavy clay products was produced by Ochs Brick & Tile Co. near Springfield.

**Carlton.**—The Zenith Dredge Co. operated a fixed sand and gravel plant at Carlton and reported output for building use, railroad ballast, and other purposes. Gravel for railroad ballast and other uses was produced by the Great Northern Railway Co. and Minneapolis, St. Paul and Sault Ste. Marie Railroad Co. Building sand and gravel was produced by Albert Obraske and White & Almer, who operated fixed plants near Moose Lake and Cloquet, respectively. Road gravel was produced by the State and county highway departments. The Nemadji Tile & Pottery Co. of Moose Lake reported output of clay used in manufacturing pottery and floor and wall tile. The Wrenshall Brick Co. of Duluth sold a small quantity of miscellaneous clay for use in water purification.

**Carver.**—Ahles & Lush operated a portable plant and reported output of road gravel. Rosenwinkel Sand & Gravel Co., Inc., operated a fixed plant near Chaska and produced sand and gravel for building use. Sand and gravel for building and road construction was produced by Wm. Mueller & Sons, operating a fixed plant near Carver. The State highway department produced road gravel.

**Cass.**—Road gravel was produced by, and under contract for, the State and county highway departments.

**Chippewa.**—Hallett Construction Co. operated a fixed sand and gravel plant near Montevideo and reported output for building and other purposes. Jay Volden produced sand for building and road use. The State highway department produced and contracted for road gravel. The Melrose Granite Co. produced dimension granite for architectural and monumental use from a quarry near Montevideo. The stone was processed at the company plant in St. Cloud.

**Chisago.**—Sand and gravel for road use was produced under contract for the county highway department. The Minnesota Highway

Digitized by Google

Department produced and contracted for road gravel. William Danner reported output of marl for agricultural stone.

**Clay.**—Sand and gravel for building and road construction was produced by Ames Sand & Gravel, Inc., Kost Bros., Inc., and Ulven Gravel Co. Rollo Lewis operated a portable plant near Sabin and produced sand and gravel for road use. Road gravel was produced by H. A. MacDonald, Thomson Bros., and under contract for the State and county highway departments.

**Clearwater.**—The Minnesota Highway Department produced road gravel.

**Cook.**—Sand and gravel for road use was produced by the State and county highway departments.

Construction at Taconite Harbor—the Erie Mining Co. harbor on the north shore of Lake Superior—was in the final stages at the end of 1956. From this point taconite concentrate pellets to be produced by the company at its new plant near Aurora will be shipped to lower Lake ports. First shipments from Taconite Harbor were expected to begin in the fall of 1957. Excavation of the harbor was performed, utilizing a coffer dam, which consisted of a string of 50-foot-diameter sheet-piling cells driven to the bottom of Lake Superior. These interconnected cells were filled with gravel, forming the dam. After the water was pumped out of the future harbor area, the contractor was able to proceed with the excavation in much the same manner as quarrying in an open pit. The ore dock is about 1,800 feet long and has a storage capacity of 100,000 tons of pellets. Traveling-belt conveyors were to be used for loading pellets into ore freighters. Other facilities at Taconite Harbor included a powerplant (which was to supply power for Erie's entire taconite project) and unloading facilities for coal and petroleum products. By the end of 1956 conveyors for ore and coal and other equipment and machinery had been installed and were being tested by contractors.

**Cottonwood.**—Windom Sand & Gravel Co. operated a fixed plant near Windom and reported output of sand and gravel for building use and fill. Road gravel was produced by and for the State and county highway departments.

**Crow Wing.**—Iron ore was the chief mineral product of the county. Operating companies and mines from which iron ore was shipped in 1956 were:

| Company: | *Mines operated* |
|---|---|
| Dates Mining Co | Pennington. |
| M. A. Hanna Co | North Yawkey, Portsmouth group, and Rowe Tailings. |
| Hanna Coal & Ore Corp | Feigh, Huntington, Louise, Maroco, and South Hillcrest. |
| Inland Steel Co | Armour No. 1. |
| Pickands Mather & Co | Mahnomen and Rabbit Lake. |
| Rhude & Fryberger | Carlson-Nelson and South Hillcrest. |
| Zontelli Bros., Inc | Mangan-Joan, Mangan-Stai, Manuel, Virginia, and West Airport. |

All mines except the Armour No. 1 were open pit. Ore from the Armour No. 2 mine was hoisted through the No. 1 shaft. Of the total iron ore shipped from the county in 1956, approximately 47 percent was of direct-shipping grade, and the remainder was concentrate, including sinter. First shipments were recorded from the Carlson-

Digitized by Google

Nelson mine, operated by Rhude & Fryberger near Riverton, which was under development since 1954. The South Yawkey and Section 6 mines, which were operated in 1955, were idle during 1956. Tailing from the Rowe mine was reprocessed and sintered by M. A. Hanna Co. at the Portsmouth concentrating and sintering plants.

All shipments of manganiferous ore (containing 5 to 35 percent manganese, natural) from Minnesota in 1956 were from Crow Wing County. Operating companies and mines in 1956 were: Hanna Coal & Ore Corp., the Alstead group; Pickands Mather & Co., the Mahnomen and Sagamore mines; and Zontelli Bros., Inc., the Mangan-Joan, Mangan-Stai, Merritt stockpile, and the Virginia mines.

Manganese Chemicals Corp. operated its plant near Riverton and produced manganese carbonate, manganese dioxide, and other manganese products. Capacity of the plant was 200 long tons of crude ore input daily. Raw material for the plant was Cuyuna-range manganiferous ore. The recovery method utilized was the Dean-Leute ammonia-leaching process.

Hallett Construction Co. operated a portable sand and gravel plant near Fort Ripley and reported output for building and road construction and other uses. The State and county highway departments produced and contracted for road gravel.

Marl for agricultural use was produced by Tweed Bros. near Pequot Lakes.

**Dakota.**—J. L. Shiely Co. produced dimension and crushed limestone at its Mendota quarry. Output was used for rubble, architectural stone, flagging, riprap, concrete aggregate, roadstone, railroad ballast, and agricultural stone. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced limestone riprap.

Sand and gravel for building use was produced by Standard Building Materials Co. in South St. Paul and Edward M. Husting near Hastings. Emil Hanson produced road gravel near Farmington. Bituminous Surface Treating Co. produced gravel, chiefly for asphalt mix. The Minnesota Highway Department produced and contracted for gravel for road use. Road gravel was also produced under contract for the Hennepin County Highway Department.

**Dodge.**—The Dodge County highway department produced crushed limestone, chiefly for road maintenance. Road gravel was produced by and for the State highway department.

**Douglas.**—Alexandria Sand & Gravel Co. operated a fixed plant near Carlos and produced building sand and gravel. The State highway department produced and contracted for road gravel. The county highway department also produced road gravel.

**Faribault.**—H. R. Loveall produced sand and gravel near Winnebago for building and road construction. Road gravel was produced by Clarence Zufall and the State highway department and also under contract for the State and county highway departments.

**Fillmore.**—Iron ore was produced by two companies in the county in 1956. Hanna Coal & Ore Corp. operated its Spring Valley group of mines, from which 275,575 long tons of concentrate was shipped during the year. The Schroeder Mining Co. shipped 73,993 long tons of concentrate from the Krueger mine near Chatfield. Both companies treated their ores at washing plants.

Digitized by Google

Output of crushed limestone for road surfacing and agricultural use was reported by Hadland & Vreeman from quarries near Spring Valley and Preston and by Pederson Bros. from a quarry near Harmony. Other limestone producers in the county were Johnson Construction Co. and Edwin C. Kappers.

Paving sand was produced by Oliver Moen near Lanesboro. Allen Thompson operated a fixed plant near Peterson and reported output of sand for building use. The State highway department produced road gravel.

**Freeborn.**—Sand and gravel for building and road construction was produced by M. N. Nelson near Clarks Grove and by Emil Olson & Sons. Road gravel was produced by the State Highway Department and also under contract for the State and county highway departments.

**Goodhue.**—Mann Construction Co. operated various limestone quarries in the county in 1956 and reported output for agricultural and road purposes. Valley Construction Co. produced crushed limestone near Zumbrota for railroad ballast and agricultural stone. Fischer Construction Co. produced crushed limestone for concrete aggregate and roadstone.

Output of building sand and gravel was reported by Hallett Construction Co. from a pit near Frontenac. Harry M. Berktold produced sand and gravel near Lake City for building and road purposes. Arthur Mickow operated a fixed plant near Lake City and produced building and paving sand. Sand and gravel for road use was produced by, and under contract for, the city of Red Wing. Road gravel was produced by the city of Cannon Falls and the State highway department and also under contract for the State and county highway departments.

Clay for manufacturing heavy clay products was produced near Goodhue by the Red Wing Sewer Pipe Corp.

**Grant.**—Sand and gravel for railroad ballast and other uses was produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad. Sam Olson produced building sand and gravel. The State highway department produced and contracted for road gravel.

**Hennepin.**—Over 2.5 million tons of sand and gravel was produced in Hennepin County in 1956. Output was used for a variety of purposes, including building and road construction, railroad ballast, and roofing. Commercial operators reporting production in 1956 were: Anderson Aggregates, Barton Contracting Co., Concrete Service, Inc., Consolidated Builders Supply Co., J. W. Craig Co., Chas. M. Freidheim Co., Glacier Sand & Gravel Co., J. V. Gleason, Great Northern Railway Co., F. W. Hedberg & Sons, Industrial Aggregate Co., Keller Bros. Gravel Co., Landers-Norblom-Christenson., Mapco Sand & Gravel Co., Oscar Roberts Co., Inc., and Woodrich Construction Co. All operations were in the vicinity of Minneapolis. Sand and gravel for road use was also produced by and for the State and county highway departments. Crushed limestone was produced by Landers-Norblom-Christenson Co. for use on parking lots and driveways, for railroad ballast, and as filler for asphalt and fertilizers.

Lithium Corp. of America continued production of lithium salts and metal at its plant in St. Louis Park. In 1956 the company completed expanding its lithium and lithium hydride operations,

465877—58——40

Digitized by Google

which would approximately double productive capacity in those fields. Lithium minerals processed at the plant were produced in North Carolina; Quebec, Canada; and Southern Rhodesia.

Crude perlite was expanded in Minneapolis at plants operated by Minnesota Perlite Co. and Western Mineral Products Co. The expanded product was used as lightweight aggregate in plaster and concrete and for other purposes. Raw material for these plants was produced in Colorado and Nevada. Western Mineral Products Co. also produced exfoliated vermiculite from crude material mined in Montana for use as insulation and lightweight aggregate.

**Houston.**—Hector Construction Co., Inc., operating a limestone quarry near Caledonia, and Botcher Bros. & Son, who operated quarries near La Crescent and Mound Prairie, produced crushed limestone for road material. Heintz & Smith produced crushed and broken limestone for riprap, concrete aggregate and roadstone, and agricultural stone.

Road gravel was produced by Roverud Construction Co. near Spring Grove and by the State highway department.

**Hubbard.**—The Minnesota Highway Department produced and contracted for road gravel.

**Isanti.**—Road gravel was produced by Lindquist-Olson Co. near Cambridge and under contract for the county highway department.

**Itasca.**—Mineral production in the county consisted principally of iron ore. Shipments of usable iron ore from mines in the county in 1956 decreased 4 percent below 1955, because of a 5-week labor strike in midsummer. Over 93 percent of the total usable ore shipments from the county was beneficiated; the remainder was of direct-shipping grade. Operating companies and mines from which iron ore was shipped in 1956 were:

| Company: | *Mines operated* |
|---|---|
| Butler Bros | Aromac, Harrison group, MacKillican, Patrick "A" group, Patrick "C," Snyder, and Wyman. |
| Cleveland-Cliffs Iron Co | Canisteo, Hawkins, Hawkins Tailings, Hill-Trumbull, Holman-Cliffs, and Sargent. |
| M. A. Hanna Co | Buckeye, Hunner, and Mississippi group. |
| Hanna Coal & Ore Corp | Carlz No. 2 and Perry. |
| Jessie H. Mining Co | Jessie. |
| Jones & Laughlin Steel Corp | Hill Annex. |
| Oliver Iron Mining Division, U. S. Steel Corp. | Arcturus group, King group, and Plummer. |
| Pacific Isle Mining Co | Mississippi No. 1, and St. Paul. |
| Pickands Mather & Co | Bennett group, Danube, Tioga No. 2, and West Hill. |

All mines were open-pit operations; no underground mining has been done in the county since 1953.

First shipments of iron ore were recorded from the Hunner mine, operated near Coleraine by M. A. Hanna Co. Stripping at the mine, formerly called the Parcel No. 3, was begun in the summer of 1955. A new concentrating plant was put into operation at the mine in the summer of 1956. The plant included a standard wash section, a dense-medium separation unit, and a spiral section.

Digitized by Google

Work was begun near Calumet on a new plant of Jones & Laughlin Steel Corp. for concentrating material contained in a tailing-pond basin near the Hill Annex mine. The tailing was to be mined by a hydraulic dredge and pumped to the plant for treatment by spirals and froth flotation.

Oliver Iron Mining Division of United States Steel Corp. began constructing a dense-medium plant adjacent to the company Trout Lake Concentrator near Coleraine.

A new screening, crushing, and washing plant was constructed at the St. Paul mine, operated by Pacific Isle Mining Co. near Keewatin.

Cleveland-Cliffs Iron Co. added a cyclone ore-treatment plant to its concentrating facilities at the Holman-Cliffs mine near Taconite.

Mines operated in 1955 but not in 1956 were: The Argonne (Hanna Coal & Ore Corp.), Galbraith (Butler Bros.), and Missouri L. O. S. P. (Pacific Isle Mining Co.). The Argonne was considered exhausted.

The State and county highway departments produced and contracted for road gravel.

**Jackson.**—Sand and gravel for building purposes was produced by Willett Gravel Co., which operated a fixed plant near Jackson. The State and county highway departments produced and contracted for road sand and gravel.

**Kanabec.**—Cold Spring Granite Co. produced architectural and monumental dimension granite at its Mora Grey quarry. The company processed the rough material at its finishing plant in Cold Spring. Blomberg Sand & Gravel Co. produced building sand and road gravel near Braham. Road gravel also was produced by the State highway department and under contract for the Isanti County Highway Department.

**Kandiyohi.**—New London Materials & Construction Co. produced sand and gravel near New London for building and road construction, railroad ballast, and other uses. Ed Beske (Atwater Sand & Gravel) reported output of sand and gravel for building and road purposes. The Great Northern Railway Co. produced gravel for railroad ballast and other uses. The State highway department produced and contracted for road gravel.

**Kittson.**—Road gravel was produced by and for the Minnesota Highway Department.

**Koochiching.**—The State highway department produced and contracted for road gravel.

**Lac qui Parle.**—Dimension granite for monumental use was produced by North Star Granite Corp. from its No. 9 quarry near Odessa. The rough stone was finished at the company plant in St. Cloud. Cold Spring Granite Co. produced granite for architectural and monumental purposes at its Cold Spring Red quarry near Odessa. Output was processed at the company finishing plant in Cold Spring. Granite for monumental use was also produced in the county by the Dakota Granite Co. of Milbank, S. Dak., near Bellingham and from the Simonson quarry, operated by Liberty Granite Co., Inc.

Hallett Construction Co. produced sand and gravel near Odessa for building and road construction and other uses. Road gravel was produced by and for the State and county highway departments.

Digitized by Google

**Lake.**—In March 1956 Reserve Mining Co. began the first full-scale operation of the E. W. Davis Works, its taconite-processing plant at Silver Bay on the north shore of Lake Superior. On April 6, 1956, the first cargo of taconite-concentrate pellets was shipped from Silver Bay. In spite of the steel strike interruption in midsummer, over 3.5 million tons of pellets were shipped from this port in 1956.

Crude taconite was crushed to about 3-inch size at the mine and hauled by company-owned railroad to Silver Bay for further processing.

The concentrating plant at Silver Bay, which is approximately 1,300 feet long, consists of 12 processing sections, each made up of two 3,000-ton storage bins, 1 rod mill, 2 magnetic cobbers, 2 ball mills, 8 rougher magnetic separators, 2 rough hydroseparators, 6 finisher magnetic separators, 2 finisher hydroseparators, and 1 filter.

After the filtering process the concentrate was conveyed to the pelletizing plant, consisting of six pelletizing sections. Each of these sections contained three rotating drums, in which the concentrate was rolled into pellets. About 9 pounds of bentonite per ton of concentrate was added as a binder. The pellets were next rolled in drums, in which finely ground anthracite was added to the pellets as a coating before they were sent to the pelletizing furnace. At each section a pelletizing furnace, about 6 feet wide and 168 feet long, baked pellets on a horizontal grate to a hard finish at about 2,400° F. After being cooled, finished pellets were sent either to stockpile or loading bins. Although the E. W. Davis Works is operated year round, pellets are stockpiled during the winter when Lake shipping is closed. Electric power for taconite processing at both Babbitt and Silver Bay was provided by the company-owned powerplant at Silver Bay, which was part of the $190-million project. Approximately 85 kw.-hr. was required for each ton of pellets produced. Water for the plant was pumped from Lake Superior. An estimated 10,000 gallons of water was required to process 1 ton of concentrate.

Road gravel was produced by the State and county highway departments and also under contract for the State highway department.

A small quantity of gem materials, consisting chiefly of agate and thomsonite, was collected by hobbyists along the north shore of Lake Superior.

**Lake of the Woods.**—The State and county highway departments produced road gravel.

**Le Sueur.**—Limestone for architectural use, flagging, rubble, and riprap was produced by the Babcock Co. Part of the output was marketed as "marble" for interior trim and facings. Silica sand from the Jordan Sandstone formation was produced near Ottawa by the Silica Sand Corp. Output was used for building, glass manufacture, molding, and engine use and as oilfield fracturing sand. Glander Washed Sand & Gravel Co. operated a fixed plant near Le Sueur and produced sand and gravel for building and road construction. Gravel for railroad ballast and grading purposes was produced by the Chicago, St. Paul, Minneapolis & Omaha Railway Co. Road gravel was produced by Ed Swartout and by and for the State highway department.

**Lincoln.**—Tyler Cement Tile & Silo Works operated a fixed sand and gravel plant near Lake Benton and reported output for building

Digitized by Google

use. The county highway department produced gravel for building purposes and contracted for road gravel. The State highway department produced road gravel.

**Lyon.**—Marshall Sand & Gravel Co. produced sand and gravel for building use near Lynd. Road gravel was produced by McLaughlin & Schultz and the State highway department.

**McLeod.**—Sand and gravel for building and road construction was produced by Bullert Construction Co. The Minneapolis, Northfield & Southern Ry. produced gravel for railroad ballast. Road gravel was produced under contract for the county highway department.

**Mahnomen.**—Mahnomen Construction Co. produced road gravel near Mahnomen. The State and county highway departments produced and contracted for road gravel.

**Marshall.**—Ben Bjorgaard produced gravel for road use. Road gravel was also produced by the State highway department and under contract for the State and county highway departments.

**Martin.**—Daniel F. Winter operated a portable plant near Ceylon and produced road gravel. Sand and gravel for road use was produced by and for the State and county highway departments.

**Meeker.**—Grove City Surfacing Co. produced sand and gravel for road use. Sand and gravel for building and road construction was produced near Litchfield by Hallett Construction Co. and Wolter's Washed Sand. The State highway department produced and contracted for road gravel.

**Mille Lacs.**—Cold Spring Granite Co. produced dimension granite for architectural and monumental purposes at its Diamond Grey quarry near Isle. The rough material was processed at the company finishing plant in Cold Spring. The Mille Lacs Sand & Gravel Co. operated a fixed sand and gravel plant near Milaca and reported output for building use. Road gravel was produced by and under contract for the Minnesota Highway Department.

**Morrison.**—The State and county highway departments produced and contracted for gravel for road use.

**Mower.**—Austin Ready-Mix Concrete Co. produced sand and gravel at a dredging operation near Austin for use in building and road construction. The State highway department produced road gravel and the county highway department paving sand.

Ulland Bros. and Olson & Siefert produced crushed limestone for concrete aggregate and roadstone. Osmundson Bros. produced crushed limestone for agricultural and road use. Hickok Calcium White Rock Co. produced crushed limestone near LeRoy for use as flux, soil conditioner, poultry grit, and other purposes.

**Murray.**—Muecke Bros. produced sand and gravel for building use and other purposes. Road gravel was produced by the State highway department.

**Nicollet.**—Hallett Construction Co. produced sand and gravel near St. Peter for building and road use. Road gravel was produced by A. H. & J. H. Massopust near New Ulm and under contract for the Minnesota Highway Department.

**Nobles.**—Worthington Sand Co. produced sand and gravel, chiefly for building and road purposes, at a fixed plant near Rushmore.

Digitized by Google

The State and county highway departments produced and contracted for road gravel.

**Norman.**—Road gravel was produced under contract for the State highway department.

**Olmsted.**—Crushed limestone for agricultural and road use was produced in the county in 1956. Producers during the year included Barton Construction Co., Patterson Quarries, O. W. Swanson Construction Co., and Ulland Bros. Rochester Sand & Gravel Co. produced sand and gravel for building and road use and other purposes at a fixed plant near Rochester. Paving sand was produced under contract for the county highway department. Road gravel was produced by and for the Minnesota Highway Department.

**Otter Tail.**—Sand and gravel for building and road construction was produced by Mark Sand & Gravel Co. and Orville R. Edner. The Minneapolis, St. Paul & Sault Ste. Marie Railroad produced gravel for railroad ballast and other purposes. The city of Fergus Falls produced building sand and road gravel. The State highway department produced and contracted for road gravel.

**Pennington.**—Walker Sand & Gravel Co. produced sand and gravel for building use. Road gravel was produced by and for the State highway department.

**Pine.**—Louis Hultgren & Sons produced sand for molding use. Road gravel was produced by and under contract for the Minnesota Highway Department.

**Pipestone.**—Sand and gravel for building and road construction and other purposes was produced from pits near Edgerton and Woodstock by Hallett Construction Co. Gravel for railroad ballast and other uses was produced by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. Pronk Bros. produced building sand. The State highway department produced and contracted for road gravel.

**Polk.**—Spring Gravel Co. operated a fixed sand and gravel plant and reported output for building and road construction and other purposes. Thorson Gravel Co. produced gravel for road use and railroad ballast near Melvin. The Great Northern Railway Co. produced gravel for building use, railroad ballast, and other purposes. Road gravel was produced under contract for the State highway department.

Miscellaneous clay was produced near Fertile by the Red River Valley Brick Corp. of Grand Forks, N. Dak., for use in the manufacture of heavy clay products.

**Pope.**—Sand and gravel for building and road use was produced by Schmidgall Sand & Ready Mix Co., operating a fixed plant near Starbuck. The Starbuck Cement Products Co. produced sand and gravel for building use and fill near Starbuck. Road gravel was produced by the county highway department and by and for the Minnesota Highway Department.

**Ramsey.**—Silica sand was mined by the Ford Motor Co. from the St. Peter sandstone formation underlying its property in St. Paul. Output was used by the company for manufacturing glass. The East Side Stone Co. produced sand and gravel for building purposes. Sand and gravel for road use was produced by E. J. Pennig Co. and the city of St. Paul. Road gravel was produced under contract for

Digitized by Google

the United States Corps of Engineers and the State highway department.

Hurley Construction Co. produced crushed limestone for road use.

The Twin City Brick Co. reported output of miscellaneous clay, which the company used in manufacturing heavy clay products.

**Red Lake.**—The Minnesota Highway Department produced and contracted for road gravel.

**Redwood.**—Sand and gravel for building and road construction was produced by Chapman Gravel Co. near Belview and by Buterbaugh Sand Co. near Walnut Grove. Both companies operated fixed plants. Road gravel was produced by and for the State highway department.

Johnson Bros. Quarry Co. and View Quarry Co. produced dimension granite for monumental use near Belview.

**Renville.**—Granite for architectural and monumental purposes was produced by the Cold Spring Co. at its Rainbow quarry near Morton. Melrose Granite Co. operated the Melrose Tapestry quarry near Morton and produced granite for monumental use. The former company operated a finishing plant in Cold Spring; the latter, at St. Cloud.

The Danube Sand & Gravel Co. operated a fixed plant near Danube and reported output of sand and gravel for building and road construction. Fairway Construction Co. produced gravel for road use. The State highway department produced and contracted for road gravel.

**Rice.**—Sand and gravel for building and road construction was produced by Concrete Materials, Inc., and Melvin Kielmeyer. James Condon Sand & Gravel operated a portable plant near Northfield and produced sand for building use and gravel for fill. Faribault Washed Sand & Gravel produced gravel for building and road purposes. Road gravel was produced by the State highway department and under contract for the State and county highway departments.

Crushed limestone for agricultural and road uses was produced in the county in 1956. Producers during the year included Bryan Rock Products, Inc., Fischer Construction Co., and Amos Helgeson. The county highway department also purchased crushed limestone from Faribault Quarries and Klemmer Construction Co. for road stone.

**Rock.**—Grinding pebbles and tube-mill liners were produced by the Jasper Stone Co. from a quartzite deposit near Jasper. Waste material from this operation was sold for use as riprap.

Sand and gravel was produced near Luverne by the Hallett Construction Co. and C. H. Hatting Gravel Co., Inc. Output was chiefly for building and road purposes. Road gravel was produced by the Minnesota Highway Department.

**Roseau.**—The State and county highway departments produced and contracted for road gravel.

**St. Louis.**—Mineral products of St. Louis County in 1956 included cement, iron ore, lime, sand and gravel, and stone. Shipments of usable iron ore from St. Louis County in 1956 decreased 11 percent below 1955, principally because of a 34-day labor strike in the steel industry in midsummer. However, St. Louis County supplied nearly 72 percent of the total usable iron ore shipped from Minnesota mines in 1956. Approximately 74 percent of the total shipments from the

Digitized by Google

county was direct-shipping grade; the remainder was beneficiated. Operating companies and mines from which iron ore was shipped in 1956 were:

| Company: | *Mines operated* |
|---|---|
| Butler Bros | Weggum, Agnew No. 2, and South Agnew. |
| Charleson Iron Mining Co | Various LOSP. |
| Cleveland-Cliffs Iron Co | Agnew, Alworth, and Wanless. |
| Haley-Young Mining Co | Elbern. |
| M. A. Hanna Co | Douglas, Duncan, Enterprise, Morton-South Eddy, and Norpac-Impro B. |
| Jones & Laughlin Steel Corp | Columbia, Leetonia, Longyear, Missabe Mountain, Pettit, Schley, and Wentworth. |
| W. S. Moore Co | Alice, Graff, Judson Lease, Margaret, Mariska, Norman, Pilot Annex, Stubler, and Yawkey. |
| North Range Mining Co | Leonidas. |
| Oglebay, Norton & Co | St. James. |
| Oliver Iron Mining Division, U. S. Steel Corp. | Canton, Canton (St. James), Dormer group, Pillsbury-Brown (Douglas), Franklin, Gilbert, Hopewell, Hull-Rust group, Kosmerl, Leonidas stockpile, Mariska Extension, Midway No. 2, Monroe group, Morris, Mountain Iron group, Niles, Pillsbury, Pilotac, Rouchleau group, Rouchleau Prospect, Sherman group, and Spruce. |
| Pacific Isle Mining Co | Croxton-Syme, Cyprus-Rust, Drew, Emmett, Graham No. 2, Holland, Kerr, Lamberton, Langdon & Warren, Missabe Mountain, Missabe Mountain LOSP, Nordine, North Shiras, South Stevenson, Stevenson, Susquehanna LOSP, and Wacootah. |
| Pickands Mather & Co | Albany, Bennett Annex, Carmi-Carson Lake (incl. Campbell D), Embarrass, Erie Preliminary Taconite Plant, Lamberton Annex, Mahoning group, and Scranton. |
| Pioneer Mining Co | Mary Ellen. |
| Pittsburgh Pacific Co | Alpena LOSP, Bradford, Bradford Annex, Chataco, Commodore, Genoa Sparta, Sidney, Union, and Union stockpile. |
| Republic Steel Corp | Susquehanna. |
| Reserve Mining Co | Peter Mitchell. |
| Rhude & Fryberger | Boeing and Troy. |
| Rhude-Gilbert Corp | Alworth. |
| Skubic Bros. Co | Forsyth, Wheeling, and Wheeling LOSP. |
| Snyder Mining Co | Webb-Sellers and Whiteside. |
| E. A. Young, Inc | Minnewas. |
| Zontelli Bros., Inc | Graham No. 1. |

All except three mines operated in St. Louis County in 1956 were in the Mesabi range. The Pioneer and Soudan mines, operated by Oliver Iron Mining Division of United States Steel Corp., and the Zenith mine, operated by Pickands Mather & Co., were in the Vermilion range.

Development of the taconite industry in the county was continued during the year. As a result of Reserve Mining Co. beginning full-

Digitized by Google

scale operation of its E. W. Davis Works at Silver Bay, production of crude taconite at the company mine near Babbitt was increased considerably in 1956. During 1956 approximately 11 million tons of crude taconite was produced at the mine (named the Peter Mitchell), compared with 1.8 million tons in 1955. The mine supplied raw material for both the E. W. Davis Works and the pilot plant near Babbitt. The pilot plant had been operated since 1952. The ore body is on the eastern end of the Mesabi range and contains an estimated 1.5 billion tons of magnetic taconite. The deposit is about 9 miles long, averages 2,800 feet in width, and has a maximum thickness of 175 feet. Taconite mined at Babbitt was reduced to about 8-inch size in a large gyratory crusher with a capacity of 3,500 long tons per hour. Secondary crushing was also done at Babbitt in 3 smaller gyratory crushers in which the crude material was reduced to approximately 3-inch size. Most of the crushed material was then shipped over the company 47-mile interdepartmental railroad to the E. W. Davis Works at Silver Bay for further processing. The remainder was processed at the Babbitt pilot plant, which had an annual capacity of 300,000 tons of finished pellets.

Substantial progress was made during the year in the construction of the Erie Mining Co. large-scale taconite project near the new town of Hoyt Lakes. Most of the structural work at the mine site, concentrator, and pelletizing plant was completed by the end of 1956, and installation of concentrating equipment was begun. Track was laid on the 73-mile railroad which connects the plant with Taconite Harbor—the shipping port on Lake Superior. More houses for employees were completed during 1956 at Hoyt Lakes; the new town was expected to have an eventual population of about 5,000.

The new plant will be able to treat about 63,000 long tons of taconite ore per day; it has an initial rated capacity of 7.5 million tons of high-grade pellets annually. The company plans to begin production at the plant in the fall of 1957. During 1956 Erie Mining Co. continued production of taconite-concentrate pellets at its preliminary plant, which has been operated since 1948. Annual capacity of this plant is 200,000 tons of finished product. Erie Mining Co. is owned by Bethlehem Steel Corp., Youngstown Sheet & Tube Co., Interlake Iron Corp., and the Steel Co. of Canada. Pickands Mather & Co. is the operating agent.

Oliver Iron Mining Division of United States Steel Corp. also produced taconite concentrate in 1956. The company operated its Pilotac mine and plant near Mountain Iron. Concentrate produced at the Pilotac plant was agglomerated by sintering and nodulizing at the company Extaca plant at Virginia.

Development work was begun by Oliver Iron Mining Division at its Stephens mine near Aurora and the Sauntry mine near Virginia. The Stephens was operated by Oliver in 1903–5 but has been held in reserve since then. It was considered the largest inactive reserve of direct-shipping ore in the Mesabi range. Both mines were to be worked by open-pit mining methods. Oliver began constructing a large ore-sizing plant at Virginia, which will treat direct-shipping ores from the Auburn, Rouchleau, and Sauntry mines. The plant was expected to be completed in the spring of 1957. A similar plant

Digitized by Google

Klemmer Construction Co. produced crushed limestone for agricultural and road purposes.

**Stevens.**—The Minnesota Highway Department produced road gravel.

**Swift.**—The Great Northern Railway Co. produced gravel for railroad ballast and other uses. Gravel for road use and railroad ballast was produced by the Chicago, Milwaukeee, St. Paul & Pacific Railroad Co. The State and county highway departments produced and contracted for road gravel.

**Todd.**—Gravel for building use, railroad ballast, and other applications was produced by the Great Northern Railway Co. Road gravel was produced by the county highway department and under contract for the State and county highway departments.

**Traverse.**—The Minnesota Highway Department produced and contracted for road gravel.

**Wabasha.**—The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced gravel for road use and railroad ballast. Road gravel was produced by and for the State highway department. Patterson Quarries produced crushed limestone near Plainview for roadstone.

**Wadena.**—Sand and gravel for building and road construction, engine use, railroad ballast, and other purposes was produced by the Becker County Sand & Gravel Co. Road gravel was produced under contract for the State highway department.

**Waseca.**—Gene Sutter produced gravel near Waseca for building use.

**Washington.**—Approximately 1.5 million tons of sand and gravel was produced in Washington County in 1956, chiefly for building and road construction. Commercial operators during the year included Gemstone Products Co., Certified Aggregates, Inc., David Johnson, Moelter Construction Co., Shalander & Shaleen, and J. L. Shiely Co. Sand and gravel was also produced by and for the State and county highway departments.

**Watonwan.**—George Allen produced gravel for miscellaneous purposes. The State and county highway departments produced sand and gravel for road use.

**Wilkin.**—Behrens Construction Co. of Beatrice, Nebr., produced gravel for road use at its dredging operation near Wolverton. Road gravel was produced by the county highway department and under contract for the State and county highway departments.

**Winona.**—Dimension limestone for architectural use was produced by the Biesanz Stone Co. Crushed limestone was produced by Fred Fakler for road use and by Patterson Quarries for agricultural and road purposes. Winona Sand & Gravel Co. operated a dredge near Winona and produced sand and gravel for building and road construction, railroad ballast, and other uses. The county highway department produced paving sand. Road gravel was produced by and for the Minnesota Highway Department. Agate was recovered in the county by an amateur collector of semiprecious gem materials.

**Wright.**—Sand and gravel for building and road construction was produced near South Haven by Ed Schram. Road gravel was pro-

Digitized by Google

duced by Charles & Anna Frank near Delano, by Oliver Ordorff near Hanover, and by the Hennepin County Highway Department. The State and Wright County Highway Departments produced and contracted for sand and gravel. The Delano Granite Works, Inc., operated its sawing and finishing plant at Delano, where rough granite quarried by the company in Big Stone County was processed.

**Yellow Medicine.**—Dimension granite for rubble and crushed granite for railroad ballast and fill were produced near Granite Falls by the Great Northern Railway Co. Burdett C. Long operated a gravel pit near Hazel Run and reported output for road use. Road gravel was produced by the State highway department and under contract for the State and county highway departments.

Digitized by Google

Digitized by Google

# The Mineral Industry of Mississippi

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Mississippi Geological Survey.**

By Robert S. Sanford [1] and William C. Morse [2]

MISSISSIPPI'S mineral production in 1956 rose to $133.1 million in value—the highest annual total ever recorded and 9 percent over the 1955 value ($122.6 million)—primarily because of the increased output of petroleum, natural gas, and natural-gas liquids.

Petroleum represented 75 percent and natural gas 14 percent of the State's total mineral production. Other minerals (in order of importance) were sand and gravel, cement, clays, natural-gas liquids, stone, and iron ore.

The value of cement shipments increased over 1955, as did natural gas (18 percent), natural-gas liquids (18 percent), petroleum (7 percent), sand and gravel (2 percent), and stone (14 percent). Clays decreased slightly following the trend of normal construction activities after the 1955 boom.

**TABLE 1.—Mineral production in Mississippi, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 700,615 | $3,913,113 | 612,617 | $3,590,344 |
| Iron ore (usable)long tons, gross weight | | | 183 | (2) |
| Natural gasmillion cubic feet | 163,167 | 15,664,000 | 185,137 | 18,143,000 |
| Natural-gas liquids: | | | | |
| Natural gasoline and cycle products thousand gallons | 22,382 | 1,573,000 | 24,829 | 1,751,000 |
| LP-gasesdo | 12,242 | 396,000 | 10,698 | 580,000 |
| Petroleum (crude)thousand 42-gallon barrels | 37,741 | 92,840,000 | 40,824 | 100,019,000 |
| Sand and gravel | 5,624,878 | 4,603,032 | 5,314,676 | 4,701,296 |
| Stone | 572,816 | 572,816 | 655,764 | 655,764 |
| Value of items that cannot be disclosed: Iron ore and nonmetals | | 3,589,504 | | 4,173,856 |
| Total Mississippi [3] | | 122,620,000 | | 133,098,000 |

[1] Production as measured by mine shipments, mine sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] The total has been adjusted to eliminate duplication in the value of clays and stone.

[1] Chief, Division of Mineral Industries, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] Director, Mississippi Geological Survey, University, Miss.



Digitized by Google

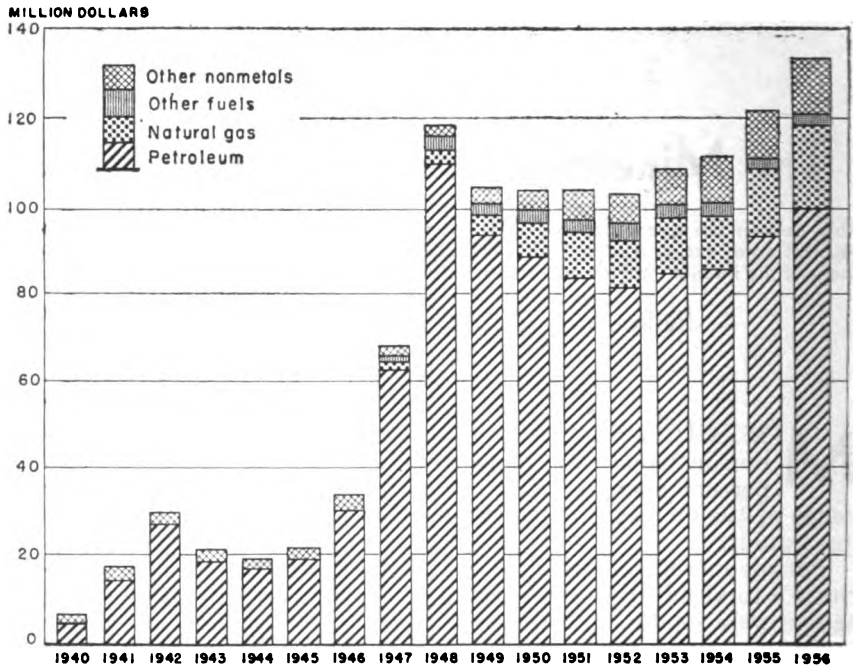



FIGURE 1.—Value of petroleum, natural gas, and total value of mineral production in Mississippi, 1940–56.

**TABLE 2.—Average unit value of mineral commodities produced in Mississippi, 1952–56**

| Commodity | | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Cement: | | | | | | |
| Portland | 376-pound barrel | $2.53 | $2.71 | $2.69 | $2.76 | $3.02 |
| Masonry | do. | | | | | 3.64 |
| Clays: | | | | | | |
| Ball clay | short ton | 14.90 | 14.57 | 15.13 | 16.19 | 16.09 |
| Bentonite | do. | 7.89 | 10.72 | 10.77 | 11.28 | 10.77 |
| Fire clay | do. | 1.61 | 1.69 | 1.61 | 1.61 | 1.00 |
| Fuller's earth | do. | 43.65 | 41.94 | 36.80 | 36.80 | 36.80 |
| Miscellaneous clay | do. | 1.08 | 1.06 | 1.06 | 1.00 | 1.00 |
| For cement manufacture | do. | 1.00 | 1.00 | | 1.00 | |
| Natural gas | thousand cubic feet | .06 | .08 | .083 | .096 | .098 |
| Natural-gas liquids: | | | | | | |
| Natural gasoline and cycle products | gallon | .077 | .071 | .07 | .07 | .07 |
| LP-gases | do. | .04 | .04 | .035 | .032 | .054 |
| Petroleum (crude) | 42-gallon barrel | 2.23 | 2.36 | 2.50 | 2.46 | 2.45 |
| Sand and gravel | short ton | .80 | .82 | .79 | .82 | .88 |
| Stone: Limestone (crushed) | do. | 1.15 | 1.15 | 1.00 | 1.00 | 1.00 |

## EMPLOYMENT AND INJURIES

Employment in the mineral industries remained relatively stable, and no fatal accidents occurred. There were 13 temporary injuries in nonmetal industries and a total of 260 days of lost time.

Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## MINERAL FUELS

The value of liquid and gaseous fuel production in 1956 reached an alltime high of $120.5 million—a gain of $10.0 million (9 percent) over 1955.

Only 9 percent of the State's crude petroleum production was processed in Mississippi's two petroleum refineries—Southland Oils, Inc., at Sandersville, and Paluxy Asphalt Co. at Crupp Station; and 25 percent of the gross production of natural gas was processed in the State's two natural-gasoline and cycle plants, Brookhaven Gas Cycling Plant in Lincoln County and Cranfield Gas Cycling Operations, Adams and Franklin Counties. Large quantities of petroleum and natural gas continued to be transmitted by pipelines to industrial sections of other States. Less than 8 percent of the gasoline sold in Mississippi was processed in the State.

In all, 155 oil pools and 36 gas pools were producing in 124 fields in the State at the year end; 2,374 wells were in production (an increase of 35 wells over 1955), including 626 flowing and 1,748 artificial lift wells.

According to the Mississippi State Oil and Gas Board, the number of wells drilled in the State in 1956 totaled 402, or 35 less than in 1955. Of these, 201 were exploratory wells, and the remaining 201 were field-development wells. Dry holes totaled 271, representing 188 exploratory and 83 field failures. Field wells drilled in 1956 and completed as producers resulted in 105 oil and 13 gas wells. The 402 wells drilled represented 2.9 million feet of drilled holes, an average depth of 7,168 feet per well compared with 3.3 million feet of drilled holes, an average depth of 7,509 feet per well in 1955. Exploratory drilling was increased from 176 wells in 1955 to 201 in 1956. Twelve petroleum discoveries and one gas discovery were made as follows: 6 in Adams, 2 each in Jefferson and Wilkinson, and 1 each in Franklin, Issaquena, and Monroe Counties. The proved reserves declined for the second successive year as follows: Petroleum, 5 percent; natural gas, 8 percent; and natural-gas liquids, 3 percent.

**Natural Gas.**—The value of marketed production of natural gas attained the alltime high of $18.1 million. Mississippi was the eighth ranking natural-gas producer in the Nation. Gross withdrawal of natural gas was 288,000 million cubic feet and marketed production 185,137 million cubic feet. Counties leading in natural-gas production in 1956 were Jefferson Davis, Adams, Forrest, Lincoln, Lamar, and Marion.

Underground storage of natural gas in the State was increased from 1 pool with 3 active wells in 1955 to 2 pools with 22 active wells in 1956. These 2 pools had a total reservoir capacity of 1,051 million cubic feet. The 2 field compressor stations, with a total of 2,600 horsepower installed capacity, were increased 2,000 horsepower during the year.

**Natural-Gas Liquids.**—Production of natural-gas liquids reversed the 3-year downward trend and gained in quantity and value during



Digitized by Google

**TABLE 3.—Total well completions in 1956, by counties [1]**

| County | Proved field or development wells | | | Exploratory wells | | | Total | | | Grand total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Oil | Gas [2] | Dry | Oil | Gas | Dry | Oil | Gas | Dry | |
| Adams | 29 | | 33 | 6 | | 41 | 35 | | 74 | 109 |
| Amite | | | | | | 1 | | | 1 | 1 |
| Claiborne | | | | | | 3 | | | 3 | 3 |
| Clarke | 2 | | 1 | | | 8 | 2 | | 9 | 11 |
| Copiah | | | | | | 1 | | | 1 | 1 |
| Forrest | 4 | 9 | 4 | | | 5 | 4 | 9 | 9 | 22 |
| Franklin | 3 | | 9 | 1 | | 10 | 4 | | 19 | 23 |
| Greene | | | | | | 2 | | | 2 | 2 |
| Hancock | 2 | | 2 | | | 3 | 2 | | 5 | 7 |
| Harrison | | | | | | 1 | | | 1 | 1 |
| Hinds | 6 | | | | | 3 | 6 | | 3 | 9 |
| Issaquena | | | | 1 | | 5 | 1 | | 5 | 6 |
| Itawamba | | | | | | 1 | | | 1 | 1 |
| Jasper | 10 | 2 | 4 | | | 4 | 10 | 2 | 8 | 20 |
| Jefferson | 6 | | 11 | 2 | | 27 | 8 | | 38 | 46 |
| Jefferson Davis | | 1 | | | | | | 1 | | 1 |
| Jones | 7 | | 2 | | | 1 | 7 | | 3 | 10 |
| Lamar | | | | | | 2 | | | 2 | 2 |
| Lauderdale | | | | | | 1 | | | 1 | 1 |
| Lawrence | | | | | | 1 | | | 1 | 1 |
| Leflore | | | | | | 1 | | | 1 | 1 |
| Lincoln | 1 | | 1 | | | 1 | 1 | | 2 | 3 |
| Madison | 1 | | 1 | | | 3 | 1 | | 4 | 5 |
| Marion | | | | | | 1 | | | 1 | 1 |
| Monroe | | | | | 1 | 1 | | 1 | 1 | 2 |
| Panola | | | | | | 1 | | | 1 | 1 |
| Pearl River | 4 | 1 | 2 | | | 6 | 4 | 1 | 8 | 13 |
| Perry | | | | | | 2 | | | 2 | 2 |
| Pontotoc | | | | | | 1 | | | 1 | 1 |
| Rankin | | | | | | 2 | | | 2 | 2 |
| Simpson | | | | | | 1 | | | 1 | 1 |
| Smith | 5 | | | | | 6 | 5 | | 6 | 11 |
| Stone | | | | | | 2 | | | 2 | 2 |
| Sunflower | | | | | | 1 | | | 1 | 1 |
| Tippah | | | | | | 1 | | | 1 | 1 |
| Warren | | | | | | 1 | | | 1 | 1 |
| Wayne | 10 | | 2 | | | 8 | 10 | | 10 | 20 |
| Wilkinson | 12 | | 11 | 2 | | 26 | 14 | | 37 | 51 |
| Yazoo | 3 | | | | | 3 | 3 | | 3 | 6 |
| Total: 1956 | 105 | 13 | 83 | 12 | 1 | 188 | 117 | 14 | 271 | 402 |
| 1955 [3] | 147 | 16 | 98 | 10 | | 166 | 157 | 16 | 264 | 437 |

[1] Mississippi State Oil and Gas Bulletin, Jackson, Miss., vol. 57, No. 5, July 1957, pp. 165–176.
[2] Includes condensate.
[3] Revised figures.

**TABLE 4.—Estimated proved reserves of crude oil, natural-gas liquids, and natural gas [1]**

| | Proved reserves, Dec. 31, 1955 | Changes in proved reserves, due to extensions and new discoveries in 1956 | Proved reserves, Dec. 31, 1956 (production was deducted) | Change from 1955, percent |
|---|---|---|---|---|
| Crude oil.....thousand barrels | 387,702 | 19,553 | 368,205 | −5 |
| Natural-gas liquids [2] [3].....do | 57,876 | 1,636 | 56,003 | −3 |
| Natural gas [3].....million cubic feet | 2,608,340 | 73,240 | 2,403,326 | −8 |

[1] Gas Facts, 1956 (published by American Gas Association), pp. 9, 13, 16.
[2] Innludes condensate, natural gasoline, and LP-gases.
[3] Proved recoverable reserves.

1956. The production of natural-gas liquids, as shown on county table 13 for 1955 and 1956, are not comparable. In 1956 production of natural-gas liquids was credited to the county in which the natural-gasoline and cycle plant was situated; in 1955 it was credited to the county where the wells were situated.

Digitized by Google

**TABLE 5.—Marketed production of natural gas, 1947–51 (average) and 1952–56**

| Year | Quantity (million cubic feet) | Value (thousand dollars) | Year | Quantity (million cubic feet) | Value (thousand dollars) |
|---|---|---|---|---|---|
| 1947–51 (average) | 88,199 | 5,345 | 1954 | 140,448 | 11,657 |
| 1952 | 174,100 | 10,620 | 1955 | 163,167 | 15,664 |
| 1953 | 154,254 | 12,340 | 1956 | 185,137 | 18,143 |

**TABLE 6.—Gross withdrawals and disposition of natural gas, 1952–56, in million cubic feet**

| Year | Withdrawals [1] | | | Disposition | | |
|---|---|---|---|---|---|---|
| | From gas wells | From oil wells | Total | Marketed production [2] | Repressuring | Vented and wasted [3] |
| 1952 | 184,200 | 81,500 | 265,700 | 174,100 | 47,605 | 43,995 |
| 1953 | 180,000 | 75,000 | 255,000 | 154,254 | 53,223 | 47,523 |
| 1954 | 167,000 | 70,000 | 237,000 | 140,448 | 58,645 | 37,907 |
| 1955 | 193,000 | 73,000 | 266,000 | 163,167 | 62,598 | 40,235 |
| 1956 | 206,000 | 82,000 | 288,000 | 185,137 | 66,654 | 36,209 |

[1] Marketed production plus quantities used in repressuring, vented, and wasted.
[2] Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
[3] Includes direct waste on producing properties and residue blown to air (partly estimated).

**TABLE 7.—Natural-gas liquids produced, 1947–51 (average) and 1952–56**

| Year | Natural gasoline | | LP-gases | | Total | |
|---|---|---|---|---|---|---|
| | Thousand gallons | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) | Thousand gallons | Total (thousand dollars) |
| 1947–51 (average) | 28,347 | 1,954 | 16,870 | 674 | 45,217 | 2,628 |
| 1952 | 33,726 | 2,606 | 19,614 | 777 | 53,340 | 3,383 |
| 1953 | 32,214 | 2,295 | 17,724 | 713 | 49,938 | 3,008 |
| 1954 | 27,804 | 1,944 | 15,288 | 528 | 43,092 | 2,472 |
| 1955 | 22,382 | 1,573 | 12,242 | 396 | 34,624 | 1,969 |
| 1956 | 24,829 | 1,751 | 10,698 | 580 | 35,527 | 2,331 |

**Petroleum.**—The 1956 value of petroleum production—$100.0 million—was surpassed only during the peak year 1948, when $110.3 million was realized. Petroleum was produced in 26 of the State's 82 counties; the 5 leading were: Adams, Jasper, Lamar, Yazoo, and Lincoln, in order of their importance.

**TABLE 8.—Production of crude petroleum, 1947–51 (average) and 1952–56**

| Year | Production (thousand barrels) | Value | |
|---|---|---|---|
| | | Thousand dollars | Average per barrel |
| 1947–51 (average) | 38,785 | 87,290 | $2.25 |
| 1952 | 36,310 | 80,970 | 2.23 |
| 1953 | 35,620 | 84,060 | 2.36 |
| 1954 | 34,240 | 85,600 | 2.50 |
| 1955 | 37,741 | 92,840 | 2.46 |
| 1956 | 40,824 | 100,019 | 2.45 |

Digitized by Google

**TABLE 9.—Indicated demand, production and stocks of crude petroleum in 1956, by months**

(Thousand barrels)

| Month | Indicated demand | Production | Stocks originating in Mississippi |
|---|---|---|---|
| January | 3,378 | 3,443 | 2,977 |
| February | 3,336 | 3,210 | 2,851 |
| March | 3,286 | 3,529 | 3,094 |
| April | 3,328 | 3,250 | 3,016 |
| May | 3,726 | 3,376 | 2,666 |
| June | 3,196 | 3,310 | 2,780 |
| July | 3,147 | 3,423 | 3,056 |
| August | 3,542 | 3,442 | 2,956 |
| September | 3,522 | 3,324 | 2,758 |
| October | 3,625 | 3,410 | 2,543 |
| November | 2,687 | 3,438 | 3,194 |
| December | 3,814 | 3,669 | 2,897 |
| Total: 1956 | 40,587 | 40,824 | ---- |
| 1955 | 37,651 | 37,741 | ---- |

**TABLE 10.—Production of crude petroleum, 1952–56, by fields**

(Thousand barrels)

| Field | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Baxterville | 6,212 | 5,940 | 5,137 | 5,301 | 5,874 |
| Bolton | ---- | ---- | ---- | ---- | 842 |
| Brookhaven | 3,905 | 4,211 | 3,724 | 3,511 | 3,019 |
| Cranfield | 2,792 | 2,398 | 1,776 | 1,497 | 1,299 |
| Eucutta | 1,670 | 1,542 | 1,352 | 1,355 | 1,484 |
| Heidelburg | 3,437 | 3,336 | 3,098 | 3,253 | 3,641 |
| La Grange | 3,277 | 2,701 | 2,269 | 2,128 | 2,137 |
| Mallalieu | 1,944 | 1,484 | 1,252 | 1,117 | 1,021 |
| Soso | 288 | 316 | 748 | 3,110 | 4,289 |
| Tinsley | 4,934 | 4,545 | 4,326 | 4,475 | 4,399 |
| Yellow Creek | 1,633 | 1,652 | 1,526 | 1,433 | 1,494 |
| Other fields | 6,218 | 7,495 | 9,032 | 10,561 | 11,325 |
| Total | 36,310 | 35,620 | 34,240 | 37,741 | 40,824 |

## NONMETALS

**Cement.**—The Brandon cement plant of Marquette Cement Manufacturing Co. continued to be the only facility in the State producing cement. Production and sales of portland cement from this plant continued to gain but masonry cement decreased slightly during 1956.

In May 1956 Mississippi Valley Portland Cement Co., started to construct a cement plant on the Yazoo River about 10 miles north of Vicksburg. The plant will have a rated daily capacity of 2,000 barrels of cement and will employ approximately 100 workers. Also, provision was made for expansion to 4,500 barrels daily. Production was scheduled to begin during November 1957.[3]

**Clays.**—During the year, 612,600 short tons of clays valued at $3.6 million was produced in 19 Mississippi counties. Appreciable quantities of bentonite, fuller's earth, miscellaneous clay, ball clay, and fire clay were produced.

Bentonite production, reported from Itawamba, Monroe, Pearl River, and Smith Counties, declined in quantity and in average price from $11.28 to $10.77 per ton during 1956. Bentonite was used

[3] Pit and Quarry, vol. 48, No. 9, March 1956, p. 38; Rock Products, vol. 59, No. 11, November 1956, p. 46.

Digitized by Google

locally and exported to other States for use as a binder in refractories, decoloration and filtration of oils, detergents and emulsions, drilling muds, and filtering.

Production of fuller's earth from Tippah County, used for absorbents, decreased in quantity and value during the year. The average price remained stable at $36.80.

**TABLE 11.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds**

| Year | Bentonite | | Ball clay, fire clay, and fuller's earth | | Miscellaneous clay | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 243,740 | $1,496,611 | 33,574 | $409,934 | 240,151 | $226,220 | 517,465 | $2,132,765 |
| 1952 | 224,903 | 1,774,930 | 72,429 | 677,505 | 211,767 | 229,128 | 509,099 | 2,681,563 |
| 1953 | 189,211 | 2,028,040 | 71,235 | 814,516 | 299,601 | 315,829 | 560,047 | 3,158,385 |
| 1954 | 185,554 | 1,998,052 | 57,779 | 770,265 | 316,068 | 334,815 | 559,401 | 3,103,132 |
| 1955 | 226,852 | 2,558,399 | 79,922 | 959,373 | 393,841 | 395,341 | 700,615 | 3,913,113 |
| 1956 | 219,216 | 2,360,031 | 93,787 | 930,699 | 299,614 | 299,614 | 612,617 | 3,590,344 |

Production of miscellaneous clay decreased from 1955 both in tonnage and total value. The average price remained stable at $1.00 a ton.

Mississippi ball clay, produced in Panola County and consumed mainly by the refractory industry, increased in quantity and total value but declined in price from $16.19 to $16.09 a ton from the previous year.

Production of fire clay, all from Marshall County, increased over 1955; the average price declined from $1.61 to $1.00 during the year. Fire clay was used for heavy clay products.

Mosaic Tile Co. affiliated with a new tile manufacturing plant in Jackson, Miss., to produce 12 million square feet of glazed ceramic wall tile yearly. The new plant, which was part of Mosaic's long-term expansion program, was to have 2 tunnel kilns each 300 feet long.[4]

Holly Springs Brick & Tile Co., Holly Springs, Miss., added 2 new periodic kilns in 1956 for a capacity increase of 500,000 bricks a month.

**Salt.**—Two salt domes were discovered during exploration for petroleum. Although salt was not mined in Mississippi, 51 salt domes were known within the State.[5]

**Sand and Gravel.**—The value of sand and gravel produced in Mississippi reached an alltime high of $4.7 million despite a 6-percent decrease in quantity from 1955. In the order of importance, sand was used for paving, building, molding, miscellaneous uses, engine sand, railroad ballast, and blast sand. Gravel was used for paving, building, railroad ballast, and other purposes. Sand and gravel was produced in 23 of the State's counties; the most important, in order of value, were: Adams, Holmes, Forrest, De Soto, and Washington Counties.

**Stone.**—Production of stone, all as crushed limestone, reached an alltime high of 655,764 short tons valued at $655,764, a 14-percent increase over 1955. All of the limestone was used in manufacturing cement and as agricultural lime for soil conditioning.

[4] Ceramic Age, vol. 67, No. 1, January 1956, p. 39.
[5] Mississippi State Oil and Gas Bulletin, Jackson, Miss., vol. 57, No. 5, July 1957, pp. 10-11.

Digitized by Google

TABLE 12.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952-56

| Year | Commercial | | Government-and-contractor | | Total | | Average per ton |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 2,186,367 | $1,535,607 | 597,909 | $321,512 | 2,784,276 | $1,857,119 | $0.67 |
| 1952 | 1,845,864 | 1,482,581 | 450,713 | 350,725 | 2,296,577 | 1,833,306 | .80 |
| 1953 | 2,070,123 | 1,713,362 | 583,523 | 460,509 | 2,653,646 | 2,173,871 | .82 |
| 1954 | 5,208,459 | 4,179,421 | 233,378 | 107,450 | 5,441,837 | 4,286,871 | .79 |
| 1955 | 5,027,127 | 4,335,799 | 597,682 | 267,233 | 5,624,809 | 4,603,032 | .82 |
| 1956 | 4,990,499 | 4,554,103 | 324,177 | 147,193 | 5,314,676 | 4,701,296 | .88 |

**Water.**—Recognizing the importance of water to its welfare and economy, Mississippi in 1956 became the first of the high-rainfall Eastern States to adopt a comprehensive water-rights law based on the western type of water law, rather than on the "riparian rights" doctrine of common law, which has applied in the East. The statute created a 17-man board of water commissioners, headed by a hydraulic engineer, to accept or reject all applications for municipal, agricultural, industrial, and recreational use of water. The law declares that water in any watercourse, lake, or other natural water body of the State is public water and public wealth of the State and thus subject to the control of the water commission. Streams flowing through a property are removed from a landowner's sole jurisdiction, and building of dams or diversion structures that will interfere with downstream users must be approved by the water board. He cannot use more water from a limited source than may be interpreted to be in the public interest.

## METALS

**Iron Ore.**—An effort was made during the year to revive iron mining in Mississippi. J. E. Patridge opened a mine near the boundary between Montgomery and Webster Counties, where 183 tons of iron ore was mined and shipped.

## REVIEW BY COUNTIES

Minerals were produced in 53 (50 in 1955) of Mississippi's 82 counties. Petroleum was produced in 26 (22 in 1955) counties, natural gas in 25 (21 in 1955), natural-gas liquids in 2 (13 in 1955), clay in 19, and sand and gravel in 23. Counties producing natural-gas liquids in 1956 are not comparable with those reported in 1955, because in that year all of the natural-gas liquids were credited to the counties of origin. In 1956 these data were not available, and all natural-gas liquid produced was credited to the county in which the natural-gasoline plant was located.

**Adams.**—Adams County led in the value of minerals produced and ranked first in petroleum, natural-gas liquids, and sand and gravel and second in natural gas. Adams County continued to yield the most encouraging exploration results. The drilling of 47 exploratory holes resulted in the discovery of 6 new petroleum fields. Sixty-two development holes resulted in 29 petroleum producers and 33 dry holes. St. Catherine Gravel Co., Inc., operated a fixed plant, portable

Digitized by Google

**TABLE 13.—Value of mineral production in Mississippi, 1955–56, by counties** [1]

| County | 1955 | 1956 | Percent change | Minerals produced in 1956 in order of value |
|---|---|---|---|---|
| Adams | $22,558,177 | $23,352,204 | +3 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Alcorn | 59,049 | 50,480 | −15 | Clays. |
| Amite | 51,611 | 43,721 | −15 | Petroleum, natural gas. |
| Attala | 6,000 | 2,813 | −53 | Clays. |
| Carroll | 18,000 | 75,000 | +317 | Sand and gravel. |
| Chickasaw | 86,001 | 58,403 | −32 | Natural gas, petroleum. |
| Choctaw | 11,000 | | | |
| Clarke | 422,920 | 408,864 | −3 | Petroleum, natural gas. |
| Clay | 81,822 | 130,901 | +60 | Stone, sand and gravel. |
| Copiah | 704,839 | 460,609 | −35 | Sand and gravel. |
| De Soto | (2) | (2) | | Do. |
| Forrest | 2,545,566 | 4,452,086 | +75 | Natural gas, petroleum, sand and gravel, clays. |
| Franklin | 1,834,293 | 1,834,167 | | Petroleum, natural gas. |
| George | (2) | (2) | | Sand and gravel. |
| Greene | 10,113 | 8,812 | −13 | Petroleum, natural gas. |
| Grenada | 10,800 | 10,800 | | Sand and gravel. |
| Hancock | 78,510 | 195,812 | +149 | Petroleum, natural gas, sand and gravel. |
| Harrison | 94,000 | 94,000 | | Sand and gravel. |
| Hinds | 1,420,817 | 2,396,040 | +69 | Petroleum, sand and gravel, clays, natural gas. |
| Holmes | 170,450 | (2) | | Sand and gravel. |
| Issaquena | | 2,445 | | Petroleum. |
| Itawamba | (2) | (2) | | Clays. |
| Jasper | 16,537,328 | 15,593,048 | −6 | Petroleum, natural gas. |
| Jefferson | 5,373,413 | 5,770,006 | +7 | Do. |
| Jefferson Davis | 5,974,981 | 7,358,483 | +23 | Natural gas, petroleum. |
| Jones | 592,634 | 2,913,341 | +392 | Petroleum, natural gas, clays. |
| Lamar | 11,424,779 | 13,232,643 | +15 | Petroleum, natural gas. |
| Lauderdale | 19,200 | 13,300 | −31 | Clays. |
| Lee | (2) | (2) | | Do. |
| Leflore | 190,000 | (2) | | Sand and gravel. |
| Lincoln | 14,374,695 | 12,766,739 | −11 | Petroleum, natural gas, natural-gas liquids, clays. |
| Lowndes | 413,951 | 401,137 | −3 | Sand and gravel, clays. |
| Madison | 1,237,646 | 1,053,803 | −15 | Petroleum, natural gas. |
| Marion | 4,679,487 | 3,720,803 | −20 | Petroleum, natural gas, sand and gravel. |
| Marshall | (2) | (2) | | Clays. |
| Monroe | 1,754,152 | 1,971,429 | +12 | Clays, natural gas, petroleum, sand and gravel. |
| Montgomery | | (2) | | Iron ore. |
| Noxubee | 44,000 | 70,000 | +59 | Stone, sand and gravel. |
| Panola | 266,264 | (2) | | Clays, sand and gravel. |
| Pearl River | 1,279,037 | 1,508,550 | +18 | Petroleum, natural gas, sand and gravel, clays. |
| Perry | 78,407 | 35,916 | −54 | Petroleum, natural gas. |
| Pontotoc | (2) | (2) | | Clays. |
| Prentiss | | 7,500 | | Do. |
| Rankin | (2) | (2) | | Cement, sand and gravel. |
| Sharkey | 20,449 | | | |
| Simpson | 410,004 | 554,366 | +35 | Natural gas, petroleum. |
| Smith | (2) | 2,876,587 | | Petroleum, clays, natural gas. |
| Sunflower | (2) | 22,400 | | Clays. |
| Tippah | (2) | (2) | | Do. |
| Washington | 532,000 | (2) | | Sand and gravel. |
| Wayne | 7,362,750 | 7,896,352 | +7 | Petroleum, natural gas. |
| Webster | | (2) | | Iron ore. |
| Wilkinson | 1,586,940 | 2,294,105 | +45 | Petroleum, natural gas. |
| Yalobusha | | (2) | | Sand and gravel. |
| Yazoo | 12,024,415 | 11,512,075 | −5 | Petroleum, sand and gravel, natural gas. |
| Undistributed | 6,279,149 | 7,948,756 | | |
| Total | 122,620,000 | 133,098,000 | | |

[1] The following counties are not listed because no production was reported: Benton, Bolivar, Calhoun, Claiborne, Coahoma, Covington, Humphreys, Jackson, Kemper, Lafayette, Lawrence, Leake, Neshoba, Newton, Oktibbeha, Pike, Quitman, Scott, Stone, Tallahatchie, Tate, Tishomingo, Tunica, Union, Walthall, Warren, and Winston.
[2] Value included with "Undistributed."

plant, and dredge, which produced building and paving sand and gravel, both washed and pit run. Natchez Gravel Co. produced building sand and gravel at its fixed plant.

Digitized by Google

**Alcorn.**—Corinth Brick & Tile Co. manufactured heavy clay products from miscellaneous clay mined near Corinth.

**Benton.**—A Mississippi State Geological Survey publication discussed iron, bauxite, kaolin, and miscellaneous clay deposits in Benton County.[6] In World War I the Memphis Mining & Manufacturing Co. had erected a hot-blast charcoal furnace at Winborn, Benton County, for processing iron ore. The enterprise was of short duration, and only 125 tons of pig iron was made. In 1930 siderite had been mined for paint pigment. According to the bulletin, the typical kaolins are of such purity in their native state that it is desirable to wash them, as such beneficiation would make them comparable with the better grades of domestic and foreign kaolins.

**Carroll.**—The Leflore county engineer (Greenwood) produced pit-run gravel with his own crew.

**Clay.**—State of Mississippi Lime Plant Board continued to produce agricultural limestone from the quarry near Cedarbluff. West Point Gravel Co. produced sand for building and gravel for building and paving and for miscellaneous uses.

**Copiah.**—Traxler Gravel Co., Inc., operated a portable plant to produce paving sand and gravel; Gatesville Sand & Gravel Co. produced paving sand and some railroad-ballast gravel; Green Bros. Gravel Co. operated a fixed plant producing paving sand and gravel. Exploration for petroleum resulted in one dry hole. One salt dome was discovered during 1956 and 4 had been discovered previously.

**De Soto.**—The county ranked fourth in the value of sand and gravel produced. Memphis Stone & Gravel Co. and Smiley Sand & Gravel Co. produced sand and gravel for building and paving.

**Forrest.**—The county ranked third in production of natural gas and sand and gravel. American Sand & Gravel Co. produced building and paving sand and gravel, engine sand, railroad-ballast gravel, and miscellaneous sand and gravel. Hattiesburg Brick Works manufactured heavy clay products from miscellaneous clay. Drilling of 17 development wells resulted in 4 oil producers, 9 gas producers, and 4 dry holes.

**Franklin.**—Exploratory drilling resulted in 1 oil discovery and 10 dry holes; development drilling resulted in 3 oil producers and 9 dry holes. Petroleum and natural gas were produced in the county.

**Hancock.**—The county became a petroleum and natural-gas producer with discovery of the Ansley field in December 1955. Three exploratory wells were dry; development holes resulted in 2 oil producers and 2 dry holes. Jahncke Service, Inc., operated a dredge to produce molding sand.

**Harrison.**—Bell Gravel Co., Gulfport Gravel Co., and Leggett Sand & Gravel Co., all of Gulfport, produced building and paving sand and gravel, molding sand, and "other" sand. One dry exploratory hole was drilled.

**Hinds.**—Petroleum, natural gas, clay, and sand and gravel were produced in the county. Traxler Gravel Co., Inc., operated a portable plant to produce paving sand and gravel. Three dry exploratory wells were drilled. Six development wells were completed; all were oil productive. Johnson Cone Brick Co. and Tri-State Brick & Tile Co. manufactured heavy clay products from miscellaneous clay.

[6] Lusk, Tracy Wallace, Benton County Geology, Mississippi State Geol. Survey, Bull. 80, 1956, 104 pp.

Digitized by Google

**Holmes.**—Holmes County ranked second in the value of sand and gravel produced. Hammett Gravel Co. operated a portable plant producing paving sand and gravel.

**Issaquena.**—Exploratory drilling of 6 holes resulted in the discovery of the Valley Park field and thus Issaquena County joined the oil producing counties of the State.

**Itawamba.**—The county ranked second in clay production. Filtrol Corp. and American Colloid Co. quarried bentonite for use in filtering and decolorizing petroleum and vegetable oils. One exploratory hole was dry.

**Jasper.**—The county was the second largest producer of petroleum in the State. Natural gas was also produced. Four exploratory holes were drilled; all were dry. Sixteen development wells were drilled; 10 were oil productive, 2 were gas producers, and 4 were dry.

**Jefferson.**—The county was an important producer of petroleum and natural gas. Exploratory drilling resulted in 27 dry holes and in the discovery of the Rodney Island and Reeves fields; development drilling resulted in 6 oil producers and 11 dry holes.

**Jefferson Davis.**—The county continued to rank first in natural-gas production. Only one development hole was drilled in the county during the year; it was gas productive.

**Jones.**—Laurel Brick Works produced miscellaneous clay for manufacturing heavy clay products.

**Lamar.**—The county continued to rank third in production of petroleum and fifth in production of natural gas. Two dry exploratory holes were drilled.

**Lauderdale.**—Meridian Brick Co. mined miscellaneous clay and manufactured heavy clay products.

**Lee.**—Tupelo Brick & Tile Co. mined miscellaneous clay and manufactured heavy clay products.

**Leflore.**—Ferguson Bros. produced gravel from a pit near Greenwood.

**Lincoln.**—The county ranked fifth in petroleum production and fourth in natural-gas production during the year. Brookhaven Pressed Brick & Manufacturing Co. mined miscellaneous clay for manufacturing brick.

**Lowndes.**—In Columbus, the Columbus Gravel Co. operated a fixed plant and a dredge; Smith Gravel Co. operated a dredge and Williams Sand & Gravel Co. a fixed plant. Production included engine sand, building and paving sand and gravel, railroad-ballast gravel, and sand and gravel for ready-mix concrete, concrete block, and concrete pipe. Columbus Brick Co. mined clay for the manufacture of heavy clay products.

**Monroe.**—The county ranked first in value of bentonite produced. American Colloid Co. and Eastern Clay Products Department of the International Mining & Chemical Co. produced bentonite for refractories, foundries and steelworks, insecticides, and fungicides. Dee Nash (operating a dredge) and Francis Sand & Gravel Co. produced building and paving sand and gravel. Exploratory drilling of 2 holes resulted in 1 dry hole and discovery of the Okolona gasfield.

**Montgomery and Webster.**—J. E. Patridge of Winona mined iron ore from an open pit on or near the county line. This was the first reported production of iron ore from Mississippi in many years.

Digitized by Google

**Noxubee.**—The State of Mississippi Lime Plant Board produced limestone for use as a soil conditioner.

**Panola.**—Kentucky and Tennessee Clay Co. produced ball clay for use as refractories. J. L. O'Neal produced paving gravel. One dry exploratory hole was drilled.

A Mississippi Geological Survey publication discussed Panola County ceramic clay deposits.[7] According to the bulletin,

> The clays have many desirable properties some of which are unexcelled by other American bond clays. They also have some undesirable properties which limit their uses. The plastic, drying, and working properties of the clays are typical of high grade ball clays. The clays mature at low temperatures and are not overburned at cones 12–14. Typical clay burns to cream and light buff colors through cone 8. At cones 10, 12, and 14 the color darkens to grayish buff and brown.

**Pearl River.**—Bean & Wilkes Co. produced paving sand and gravel. Pearl River Clay Co. quarried montmorillonite clay for use in drilling mud and as a filler for insecticides and fungicides. Six exploratory holes were drilled; all were dry. Development drilling of 7 holes resulted in 4 oil producers, 1 gas producer, and 2 dry holes. Petroleum and natural gas were produced.

**Rankin.**—Marquette Cement Manufacturing Co. continued to increase the production and shipments of portland cement. Production of masonry cement declined slightly during the year. Worley Bros. operated a dredge and produced building sand and gravel. Two dry exploratory holes were drilled.

**Smith.**—Petroleum and natural gas were produced in the county. Oil-field crews drilled six dry exploratory holes and 5 oil-productive development wells. Filtrol Corp. mined bentonite for use in filtering and decolorizing.

**Sunflower.**—Delta Brick & Tile Co., Inc., mined clay for the manufacture of heavy clay products. One dry exploratory hole was drilled.

**Tippah.**—Wyandotte Chemical Corp. mined fuller's earth for use as an absorbent. One dry exploratory hole was drilled.

**Washington.**—The county ranked fifth in the value of sand and gravel. This was produced by Greenville Gravel Co. and used for building and paving and also by the Army Corps of Engineers for revetments.

**Wayne.**—The county continued as the sixth largest producer of petroleum in the State. Eight dry exploratory holes were drilled; 10 development wells were oil productive and 2 were dry holes.

**Wilkinson.**—Petroleum and natural gas were produced in the county. Exploratory drilling of 28 holes resulted in 26 dry holes and in the discovery of the Fort Adams and Doloroso fields. Development drilling of 33 holes resulted in 12 oil producers and 11 dry holes.

**Yalobusha.**—Grenada Gravel Co. operated a fixed plant to produce building and paving sand and gravel.

**Yazoo.**—Yazoo County was the fourth largest producer of petroleum in 1956. Field crews drilled 3 dry exploratory wells and 3 oil-productive development wells. Anderson Sand & Gravel Co. produced pit-run paving gravel for use as highway base course.

---

[7] Vestal, Franklin Earl, Panola County Geology: Mississippi State Geol. Survey, Bull. 81, 1956, pp. 131, 157.

Digitized by Google

# The Mineral Industry of Missouri

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Division of Geological Survey and Water Resources, Department of Business Administration of Missouri.**

By W. G. Diamond [1] and G. A. Muilenburg [2]

MISSOURI'S mineral industry set a new high record in 1956; mineral production was valued at $164 million, compared with the previous record—$152 million in 1955. Missouri led the Nation in lead production for the 49th consecutive year, ranked second in barite output, and was third in fire-clay production. Eighteen mineral commodities were produced in the State—7 metals, 7 nonmetals, and 4 mineral fuels. The five principal minerals, in

**TABLE 1.—Mineral production in Missouri, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Barite | 363,692 | $4,003,842 | 381,642 | $4,461,955 |
| Cement: Portland ..376-pound barrels | 12,255,346 | 34,912,186 | 12,013,773 | 36,888,178 |
| Clays | 2,402,401 | 6,902,323 | 2,657,815 | 8,016,220 |
| Coal | 3,232,485 | 12,771,570 | 3,282,978 | 13,222,780 |
| Copper (recoverable content of ores, etc.) | 1,722 | 1,284,612 | 1,890 | 1,606,500 |
| Iron ore (usable) ..long tons, gross weight | 260,560 | (2) | [3] 364,981 | (2) |
| Lead (recoverable content of ores, etc.) | 125,412 | 37,372,776 | 123,783 | 38,867,862 |
| Lime | 1,464,828 | 14,408,279 | 1,481,611 | 15,813,573 |
| Natural gas ..million cubic feet | 15 | 3,000 | 12 | 2,000 |
| Petroleum (crude) ..thousand 42-gallon barrels | 72 | 190,000 | 65 | 176,000 |
| Sand and gravel | 9,983,624 | 9,980,878 | 9,585,268 | 10,117,351 |
| Silver (recoverable content of ores, etc.) ..troy ounces | 268,620 | 243,115 | 295,111 | 267,090 |
| Stone | [4] 22,368,768 | [4] 29,580,414 | 24,578,243 | 33,577,211 |
| Zinc (recoverable content of ores, etc.) | 4,476 | 1,101,096 | 4,380 | 1,200,120 |
| Value of items that cannot be disclosed: Native asphalt, masonry cement, cobalt, iron oxide pigments, nickel, stone (dimension marble 1955), and values indicated by footnote 2 | ---- | 4,833,392 | ---- | 5,896,808 |
| Total Missouri [5] | ---- | 151,626,000 | ---- | 163,693,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Value included with "Value of items that cannot be disclosed."
[3] Final figure; supersedes figure given in commodity chapter.
[4] Revised figure.
[5] Total adjusted to eliminate duplicating value of clays and stone.

[1] Commodity-industry economist, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] Assistant State geologist, Geological Survey and Water Resources, Rolla, Mo.



Digitized by Google

order of value, were lead, cement, stone, lime, and coal. Mineral production was reported from 108 of the 114 counties. The counties in order of production value were: St. Francois, St. Louis, Ste. Genevieve, Jackson, and Washington.

**TABLE 2.—Average unit value of certain mineral commodities, 1952–56** [1]

| Commodity | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Barite.....short ton | $9.60 | $10.09 | $9.74 | $11.01 | $11.69 |
| Cement (portland).....376-pound barrel | 2.53 | 2.66 | 2.76 | 2.85 | 3.07 |
| Coal.....short ton | 4.08 | 4.12 | 3.99 | 3.95 | 4.03 |
| Copper.....pound | .242 | .287 | .295 | .373 | .425 |
| Gravel.....short ton | .77 | .74 | .93 | .85 | .90 |
| Lead.....pound | .161 | .131 | .137 | 1.49 | .157 |
| Lime.....short ton | 10.02 | 9.97 | 9.92 | 9.84 | 10.67 |
| Sand.....do | 1.02 | 1.02 | 1.13 | 1.15 | 1.20 |
| Silver.....troy ounce | .905 | .905 | .905 | .905 | .905 |
| Stone: | | | | | |
| Granite: | | | | | |
| Dimension.....short ton | 33.17 | 59.04 | 57.40 | 71.20 | 108.73 |
| Crushed.....do | 1.36 | 1.69 | 2.32 | 3.58 | 5.08 |
| Marble: | | | | | |
| Dimension.....do | (2) | 121.50 | 154.35 | 135.30 | 82.88 |
| Crushed.....do | 6.12 | 9.44 | 4.91 | 12.00 | 5.00 |
| Limestone: | | | | | |
| Dimension.....do | 4.47 | 5.21 | 2.68 | 6.59 | 3.12 |
| Crushed.....do | 1.48 | 1.47 | 1.29 | 1.34 | 1.34 |
| Sandstone: | | | | | |
| Dimension.....do | 4.00 | 2.14 | 17.31 | 19.57 | 19.62 |
| Crushed.....do | 1.32 | 1.48 | | | |
| Miscellaneous: | | | | | |
| Crushed.....do | .37 | .61 | .67 | .36 | .59 |
| Zinc.....pound | .166 | .115 | .108 | .123 | .137 |

[1] For greater detail on prices, by grades and markets, see vol. I, Minerals Yearbook, 1956.
[2] Data not available.

## EMPLOYMENT AND INJURIES

**Employment.**—Average annual employment in the Missouri mining industries in 1956 increased slightly, reversing a downward trend started in 1953. Average employment in the metal-mining industries increased in 1956 after decreasing for 3 consecutive years, employment in the nonmetals industries increased for the third consecutive year, and employment in the coal mining industries decreased, according to the Division of Employment Security, Department of Labor and Industrial Relations of Missouri.

**Injuries.**—Six fatal accidents occurred in Missouri metal and nonmetal industries in 1956, 1 in iron-ore mining, 1 in lead-zinc mining, 2 in clay mining, and 2 in stone mining. The fatal injuries were caused by fall of side of open pit; fall of roof (underground); rolling, shifting, or sliding material from bins, platforms, etc.; handling materials; flying particles set in motion by machinery; and miscellaneous haulage involving railroad cars and locomotives.

**Wages.**—The upward trend in wages continued as average hourly and weekly earnings advanced again in 1956, according to the Division of Employment Security, Department of Labor and Industrial Relations of Missouri.

Digitized by Google

TABLE 3.—Average annual employment and earnings of mining industries, 1955–56 [1]

| Industry | 1955 | | | | 1956 | | | |
|---|---|---|---|---|---|---|---|---|
| | Average employment | Average weekly earnings | Average weekly hours | Average hourly earnings | Average employment | Average weekly earnings | Average weekly hours | Average hourly earnings |
| Metal mining | 3,371 | $80.65 | 40.1 | $2.01 | 3,458 | $86.33 | 40.1 | $2.15 |
| Nonmetal mining | 3,999 | 72.37 | 43.9 | 1.65 | 4,026 | 77.27 | 44.9 | 1.72 |
| Coal mining | 970 | (2) | (2) | (2) | 921 | 91.20 | 37.8 | 2.41 |

[1] Letter from Henry J. St. Clair, Division of Employment Security, Department of Labor and Industrial Relations, State of Missouri, to Bureau of Mines.
[2] Annual averages not comparable owing to change in sample structure.

## DEFENSE MINERALS EXPLORATION ADMINISTRATION PROJECTS

Government participation in financing exploration projects in search of reserves of strategic minerals through the program of the Defense Minerals Exploration Administration (DMEA) continued during 1956. The program in 1956 included the investigating of lead, copper, cobalt, and nickel sources in Bollinger and Madison Counties by the National Lead Co.

## REVIEW BY MINERAL COMMODITIES

### METALS

Production and value of metals increased substantially in 1956. The year was also marked by extensive exploratory drilling and a major iron-ore discovery.

**Mine Mills and Smelters.**—National Lead Co. refined cobalt-nickel at Fredericktown throughout 1956. At Herculaneum, St. Joseph Lead Co. smelted and refined lead; over half the tonnage produced was cast in 1-ton ingots, simplifying handling and shipping. The Dale mill in Newton County, Southwestern Missouri, was operated through April by Dale Mining Co. and from May through August by Big Four Mining Co., and then abandoned. St. Joseph Lead Co. operated its Federal, Bonne Terre, Desloge, and Leadwood mills in St. Francois County and its Indian Creek mill in Washington County. Two new 9- by 12-foot rodmills were installed in the Leadwood mill to increase efficiency and cut grinding costs, according to the President's Report to Employees, St. Joseph Lead Co. The Mine La Motte mill and the Madison mill were operated in Madison County by Mine La Motte Corp. and National Lead Co.

**Cadmium, Gallium, Germanium, and Indium.**—These minor metals occur as trace elements in Missouri lead-zinc ores and were recovered as byproducts from flue dusts from zinc smelting. Determination of the origin of these metals by States is not possible, because the domestic and imported concentrates were accumulated, and accurate analyses were not made.

Digitized by Google

**Cobalt.**—Cobalt was recovered from the complex lead-copper-cobalt-nickel ores in Madison County by National Lead Co. at the cobalt-nickel refinery in Fredericktown. Title to the refinery was transferred to the United States Government during the year; the company leased the facilities.

**Columbium-Tantalum.**—Domestic euxenite concentrate was processed by Mallinckrodt Chemical Co. at St. Louis to separate columbium-tantalum and uranium products. Most of the concentrate came from a placer mine in Idaho. The products were purchased by the Government under contract.

**Copper.**—Recoverable copper was reported from mining in Madison and St. Francois Counties. Production in 1956 was greater than in 1955, as the average metal price rose to 42.5 cents per pound compared with 37.3 cents in 1955. Copper production was reported by National Lead Co. and St. Joseph Lead Co.

**Iron Ore.**—Iron-ore production commanded a more prominent position in 1956 as output increased 40 percent over 1955. The renewed interest in iron-ore mining in Missouri resulted from several factors. Expansion in the steel industry created demands on previously untouched deposits. Missouri iron ore is accessible to the steel mills in Alabama, Tennessee, and Illinois; the brown ore (limonite) contains very little phosphorus and can be blended with other iron ores to reduce the phosphorus percentage. Increased production of brown ore in Howell and Oregon Counties contributed greatly to the increased iron-ore output in the State. Hematite ore was mined in St. Francois County.

A significant iron-ore discovery was made by St. Joseph Lead Co., according to the company 1956 Annual Report. Three centers of iron-ore deposition were discovered about 40 miles northwest of Bonne Terre as the result of an airborne magnetometer survey in 1951 and subsequent exploratory work. Drilling at 1 center, known locally as the Pea Ridge deposit, indicated a large ore deposit at a depth of 1,400 to 3,000 feet. The other two bodies in the area were drilled less extensively but were considered to be of definite interest.

**Lead.**—The 1956 mine production of recoverable lead was slightly less than the 1955 output, but total value increased 4 percent. Missouri contributed 35 percent of the Nation's total lead production, and St. Joseph Lead Co., the Nation's leading-producing company, operated in St. Francois and Washington Counties. Mine production included 7 million tons of crude ore and 1.2 million tons of old tailings, which yielded 175,000 tons of concentrate containing 124,000 tons of recoverable metal valued at $38.9 million. The Southwestern Missouri region produced less than 1 percent of the State's recoverable lead; the 4 leading companies were: St. Joseph Lead Co., Mine La Motte Corp., National Lead Co., and Potter-Sims Mines, Inc.

Lead-metal price opened the year at 16.0 cents per pound, New York, rose to 16.5 cents on January 4, and dropped back to 16.0 cents on January 13, at which price it remained the rest of the year.

Digitized by Google

**TABLE 4.—Mine production of silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|
| January | 23,658 | 142 | 10,087 | 392 |
| February | 24,838 | 143 | 10,499 | 420 |
| March | 26,323 | 174 | 11,343 | 413 |
| April | 24,547 | 170 | 10,237 | 388 |
| May | 25,504 | 167 | 10,614 | 312 |
| June | 23,444 | 152 | 9,816 | 297 |
| July | 23,865 | 161 | 9,927 | 486 |
| August | 26,944 | 192 | 11,099 | 488 |
| September | 21,981 | 142 | 9,196 | 332 |
| October | 26,454 | 161 | 11,083 | 261 |
| November | 23,160 | 153 | 9,733 | 268 |
| December | 24,393 | 133 | 10,149 | 323 |
| Total: 1956 | 295,111 | 1,890 | 123,783 | 4,380 |
| 1955 | 268,620 | 1,722 | 125,412 | 4,476 |

**TABLE 5.—Mine production of silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1860–1956, in terms of recoverable metals**

| Year | Mines producing | Material sold or treated | | Silver | | Copper | |
|---|---|---|---|---|---|---|---|
| | | Crude ore (short tons) | Old tailings (short tons) | Fine ounces | Value | Short tons | Value |
| 1947–51 (average) | ------ | 6,029,978 | 1,149,565 | 150,379 | $136,100 | 2,641 | $1,125,304 |
| 1952 | 67 | 7,128,550 | 1,750,818 | 517,432 | 468,302 | 2,576 | 1,246,784 |
| 1953 | 28 | 6,674,300 | 1,483,157 | 359,781 | 325,620 | 2,374 | 1,362,676 |
| 1954 | 16 | 6,598,647 | 1,579,068 | 352,971 | 319,457 | 1,925 | 1,135,750 |
| 1955 | 18 | 6,734,346 | 1,546,126 | 268,620 | 243,115 | 1,722 | 1,284,612 |
| 1956 | 19 | 6,996,696 | 1,223,575 | 295,111 | 267,090 | 1,890 | 1,606,500 |
| 1860–1956 | ------ | (1) | (1) | 6,707,809 | 5,210,385 | 43,364 | 17,768,924 |

| Year | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 124,076 | $38,830,455 | 9,823 | $2,763,987 | $42,855,846 |
| 1952 | 129,245 | 41,616,890 | 13,986 | 4,643,352 | 47,975,328 |
| 1953 | 125,895 | 32,984,490 | 9,981 | 2,295,630 | 36,968,416 |
| 1954 | 125,250 | 34,318,500 | 5,210 | 1,125,360 | 36,899,067 |
| 1955 | 125,412 | 37,372,776 | 4,476 | 1,101,096 | 40,001,599 |
| 1956 | 123,783 | 38,867,862 | 4,380 | 1,200,120 | 41,941,572 |
| 1860–1956 | 9,449,628 | 1,316,897,508 | 3,704,503 | 491,895,285 | 1,831,772,102 |

[1] Data not available.

**TABLE 6.—Mine production of silver, copper, lead, and zinc in 1956, by classes of ore or other sources of material, in terms of recoverable metals**

| Source | Number mines | Material sold or treated (short tons) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|---|
| Lead ore [1] | 17 | 8,065,092 | 295,111 | 1,890 | 123,395 | 3,345 |
| Zinc ore | 1 | 1,967 | ---------- | ---------- | ---------- | 52 |
| Zinc-lead | 1 | 153,212 | ---------- | ---------- | 388 | 983 |
| Total | 19 | 8,220,271 | 295,111 | 1,890 | 123,783 | 4,380 |

[1] Includes lead-copper ore from 1 mine; also 1,223,575 tons of old tailings remilled, concentrates from which were mixed with those from crude ore.

Digitized by Google

**TABLE 7.—Mine production of lead and zinc in Southeastern and Central Missouri, 1947–51 (average) and 1952–56, in terms of concentrates and recoverable metals [1]**

| Year | Lead concentrate (galena) | | Zinc concentrates [2] (sphalerite) | | Recoverable metal content [3] | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lead | | Zinc | |
| | Short tons | Value [4] | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 175,275 | $31,166,183 | 1,884 | $184,166 | 122,508 | $38,336,668 | [5] 1,178 | $359,377 |
| 1952 | 178,746 | 33,325,589 | 5,703 | 637,709 | 122,942 | 39,587,324 | [6] 3,872 | 1,285,504 |
| 1953 | 182,418 | 26,622,152 | 5,369 | 347,482 | 125,273 | 32,821,526 | [6] 3,180 | 731,400 |
| 1954 | 181,790 | 29,680,857 | 6,069 | 480,412 | 125,173 | 34,297,402 | [6] 3,169 | 684,504 |
| 1955 | 180,262 | 32,428,093 | 7,507 | 700,022 | 125,357 | 37,356,386 | 3,934 | 967,764 |
| 1956 | 174,131 | 33,266,135 | 6,484 | 542,000 | 123,395 | 38,746,030 | 3,345 | 916,530 |

[1] Based on Southeastern and Central Missouri ore "dirt" and old tailings treated at mills during calendar year indicated.
[2] Includes zinc-lead carbonate concentrates.
[3] In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate "ore" and metal, it should be noted that the value given for the concentrate is that actually received by the producer whereas the value of the lead and zinc is calculated from the average price for all grades.
[4] Values given are to a certain extent arbitrary as part of the lead concentrate is smelted by the producer.
[5] Includes zinc recovered from lead-smelter slag.
[6] Includes zinc recovered from byproduct matte from lead smelting as follows: 1952, 900 tons; 1953, 327 tons; 1954, 427 tons.

**TABLE 8.—Mine production of lead and zinc in Southwestern Missouri, 1947–51 (average) and 1952–56, in terms of concentrates and recoverable metals [1]**

| Year | Lead concentrate | | | | Zinc concentrate | | | |
|---|---|---|---|---|---|---|---|---|
| | Galena | | Carbonate | | Sphalerite | | Silicate | |
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 1,991 | $416,486 | 69 | $10,114 | 16,223 | $1,651,131 | 189 | $11,952 |
| 1952 | 8,113 | 1,701,121 | ---------- | -------- | 18,671 | 2,138,108 | -------- | ---------- |
| 1953 | 791 | 135,603 | ---------- | -------- | 12,257 | 849,141 | -------- | ---------- |
| 1954 | 103 | 16,826 | ---------- | -------- | 3,713 | 378,782 | -------- | ---------- |
| 1955 | 75 | 12,750 | ---------- | -------- | 1,048 | 74,528 | -------- | ---------- |
| 1956 | 496 | 102,096 | ---------- | -------- | 1,862 | 161,502 | -------- | ---------- |

| Year | Recoverable metal content [2] | | | |
|---|---|---|---|---|
| | Lead | | Zinc | |
| | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 1,569 | $493,788 | 8,645 | $2,404,610 |
| 1952 | 6,303 | 2,029,566 | 10,114 | 3,357,848 |
| 1953 | 622 | 162,964 | 6,801 | 1,564,230 |
| 1954 | 77 | 21,098 | 2,041 | 440,856 |
| 1955 | 55 | 16,390 | 542 | 133,332 |
| 1956 | 388 | 121,832 | 1,035 | 283,590 |

[1] Based on Southwestern Missouri ore "dirt" and old tailings treated at mills during the calendar year indicated.
[2] In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate "ore" and metal, it should be noted that the value given for the concentrate is that actually received by the producer whereas the value of the lead and zinc is calculated from the average price for all grades.

Digitized by Google

**Nickel.**—The National Lead Co. recovered nickel along with cobalt at the cobalt-nickel refinery in Fredericktown.

**Silver.**—Silver recovery from Missouri lead and lead-copper ores in 1956 increased 10 percent over 1955. Silver was recovered from the refining of pig lead obtained from the smelting of ores from St. Francois and Madison Counties.

**Zinc.**—Mine production of recoverable zinc declined in 1956 for the fourth consecutive year although production increased in Southwestern Missouri. Producers included St. Joseph Lead Co., Potter-Sims Mines, Inc., and A. B. J. Mining & Development Co.; output was reported from St. Francois, Washington, Jasper, and Newton Counties. Southeastern Missouri supplied 76 percent of the total zinc output and Southwestern Missouri, 24 percent. Prime Western slab zinc opened the year at 13.0 cents per pound, East St. Louis, rose to 13.5 cents January 6; this latter price held through December.

**TABLE 9.—Tenor of lead and zinc ore, old tailings, and slimes milled and concentrates produced in 1955–56, by districts**

| | Southeastern Missouri | | Southwestern Missouri | |
|---|---|---|---|---|
| | 1955 crude ore [1] | 1956 crude ore [1] | 1955 crude ore [2] | 1956 crude ore |
| Total material milled: Crude ore.....short tons | 8,204,676 | 8,065,092 | 75,796 | 155,179 |
| Total concentrate produced: | | | | |
| Lead.....short tons | 180,262 | 174,131 | 75 | 496 |
| Zinc.....do | 7,507 | 6,484 | 1,048 | 1,862 |
| Ratio of concentrate to ore, etc.: | | | | |
| Lead.....percent | 2.20 | 2.16 | 0.10 | 0.32 |
| Zinc.....do | .09 | .08 | 1.38 | 1.20 |
| Metal content of ore, etc.: [3] | | | | |
| Lead.....do | 1.53 | 1.53 | .07 | .25 |
| Zinc.....do | .05 | .04 | .72 | .67 |
| Average lead content of galena concentrate.....do | 70.89 | 72.26 | 76.00 | 79.77 |
| Average zinc content of sphalerite concentrate...do | 58.23 | 57.33 | 57.35 | 61.82 |
| Average value per ton: | | | | |
| Galena concentrate | $179.89 | $191.04 | $170.00 | $205.84 |
| Sphalerite concentrate | 93.25 | 83.59 | 71.11 | 86.74 |

[1] Includes lead-copper ore and old tailing remilled: 1955, 1,503,466 tons; 1956, 1,223,575 tons.
[2] Includes old tailing remilled: 1955, 42,660 tons.
[3] Figures represent metal content of crude ore only insofar as it is recovered in the concentrates; data on tailing losses not available.

**TABLE 10.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1956**

[E&MJ Metal and Mineral Markets]

| Zinc concentrate | | Lead concentrate | |
|---|---|---|---|
| Period | Price per short ton | Period | Price per short ton |
| Jan. 1–Jan. 7 | $80.00 | Jan. 5–Jan. 14 | $208.52 |
| Jan. 9–Dec. 31 | 84.00 | Jan. 15–Dec. 31 | 201.32 |
| Jan. 1–Jan. 4 | 202.25 | | |

## TRI-STATE DISTRICT

The Tri-State district of Southwestern Missouri, Kansas, and Oklahoma produced 3.6 million tons of crude ore that yielded 28,600 tons of lead concentrate containing 20,400 tons of recoverable lead and also 108,000 tons of zinc concentrate that contained 57,200 tons of recover-



Digitized by Google

able zinc. Approximately 2 percent of the district lead and zinc concentrates came from Southwestern Missouri. (See Oklahoma chapter for further details on Tri-State activity.)

**TABLE 11.—Mine production of lead and zinc in the Tri-State district in 1956 in terms of material treated, concentrates, and recoverable metals**

(Short tons)

| State | Material treated | | Concentrates | | Recovered metal content | |
|---|---|---|---|---|---|---|
| | Crude ore | Old tailings | Lead | Zinc | Lead | Zinc |
| Kansas | 1,674,116 | ---- | 10,130 | 53,142 | 7,635 | 28,665 |
| Southwestern Missouri | 155,179 | ---- | 496 | 1,862 | 388 | 1,035 |
| Oklahoma | 1,755,607 | ---- | 17,971 | 52,993 | 12,350 | 27,515 |
| Total | 3,584,902 | ---- | 28,597 | 107,997 | 20,373 | 57,215 |

## SECONDARY METALS

**Iron and Steel Scrap.**—Consumption of iron and steel scrap in Missouri in 1956 totaled 1 million tons, comprising approximately 1.3 percent of the national total. Almost 23 tons of scrap was consumed for each ton of pig iron consumed in 1956, compared with a ratio of 20:1 in 1955.

**TABLE 12.—Consumption of ferrous scrap and pig iron in 1955–56**

(Short tons)

| Year | Total scrap | Pig iron | Total scrap and pig iron |
|---|---|---|---|
| 1955 | 1,017,473 | 51,864 | 1,069,337 |
| 1956 | 1,039,866 | 45,722 | 1,085,588 |

## NONMETALS

Nonmetals contributed 63 percent of the total mineral value of Missouri in 1956 with production totaling $104 million. Cement, stone, lime, sand and gravel, and clays were the principal nonmetals in terms of value.

Barite.—Missouri continued to rank second in the Nation as a producer of barite for the 13th consecutive year. A new record was established by the shipment of 381,600 tons valued at $4.5 million. Missouri led in value of shipments. Increased drilling activities in the petroleum industry supplied the rise in output. Production was

**TABLE 13.—Barite sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Total | Average per ton |
| 1947–51 (average) | 250,242 | $2,187,751 | $8.74 | 1954 | 312,791 | $3,047,436 | $9.74 |
| 1952 | 304,080 | 2,919,795 | 9.60 | 1955 | 363,692 | 4,003,842 | 11.01 |
| 1953 | 330,763 | 3,338,395 | 10.09 | 1956 | 381,642 | 4,461,955 | 11.69 |

Digitized by Google

reported in Washington and Jefferson Counties. Barite was ground at plants in Washington and St. Louis Counties.

**Cement.**—Production of portland cement increased to a new peak of 12.4 million barrels in 1956 as the plants operated at 96 percent of total capacity. Plants in St. Louis, Ralls, Jackson, and Cape Girardeau Counties produced 52 percent of the total manufactured by wet-process methods and 48 percent by dry-process methods. Shipments totaled over 12 million barrels for the second consecutive year, as demand for use on construction projects remained high. Over 96 percent of the shipments was transported by railroad and almost 4 percent by boat. Bulk shipments comprised 77 and bag shipments 23 percent.

The annual capacity of the St. Louis plant of Alpha Portland Cement Co. was increased 200,000 barrels early in 1956. Plans were announced for a 700,000-barrel expansion of this plant. New equipment will include an 11- by 380-foot kiln, 3 finish mills, slurry-storage tanks, a cooler, and 140,000-barrel bulk-loading cement-storage silos. The new 1,250,000-barrel, $7 million wet-process plant of Marquette Cement Manufacturing Co., which was being built alongside the existing plant at Cape Girardeau, neared completion. Missouri Portland Cement Co. began the expansion program at its Sugar Creek plant (near Independence), which will double its capacity. The project is scheduled for completion early in 1957. A new 10- by 32-foot, 2-compartment clinker mill was installed at the company Prospect Hill plant (near St. Louis.).[3]

**TABLE 14.—Production and shipments of portland cement, 1947–51 (average) and 1952–56, in 376-pound barrels**

| Year | Production (barrels) | Shipments | | |
|---|---|---|---|---|
| | | Barrels | Value | |
| | | | Total | Average per barrel |
| 1947–51 (average) | 9,063,362 | 8,994,999 | $20,167,432 | $2.24 |
| 1952 | 10,007,609 | 10,086,850 | 25,523,038 | 2.53 |
| 1953 | 10,281,230 | 9,860,179 | 26,238,460 | 2.66 |
| 1954 | 11,201,697 | 11,379,257 | 31,425,190 | 2.76 |
| 1955 | 12,001,304 | 12,255,346 | 34,912,186 | 2.85 |
| 1956 | 12,440,825 | 12,013,773 | 36,888,178 | 3.07 |

Masonry cement also was manufactured at each of the cement plants.

**Clays.**—Because of its many deposits of high-quality diaspore, burley, and fire clays, Missouri ranked high as a refractory-manufacturing State. Demand for refractory clay continued high in 1956, owing to the great demand for steel, to rising production in the ceramic and chemical fields, and to increasing production at refineries. All these industries use refractories. Production of miscellaneous clay also rose in 1956 to meet increased demands of the heavy clay products and cement industries. Clays were produced in 20 counties. Leading clay-producing counties included Gasconade, Audrain, Callaway, St. Louis, and Montgomery.

[3] Pit and Quarry, vol. 49, No. 7, January 1957, pp. 150–153.

Digitized by Google

**TABLE 15.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds**

| Year | Fireclay | | Diaspore | | Burley | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 1,246,837 | $4,348,294 | 42,778 | $501,320 | 49,901 | $352,127 |
| 1952 | 1,734,612 | 9,089,960 | 44,757 | 705,269 | 71,433 | 664,358 |
| 1953 | 1,392,022 | 8,562,318 | 50,144 | 962,384 | 53,971 | 563,643 |
| 1954 | 1,170,305 | 4,460,438 | 3,322 | 16,610 | 9,265 | 50,835 |
| 1955 | 1,486,253 | 5,692,467 | 11,546 | 134,208 | 31,460 | 208,259 |
| 1956 | 1,609,416 | 6,498,644 | 24,637 | 292,898 | 41,868 | 325,279 |

| Year | Miscellaneous clay | | Total | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 660,805 | $555,974 | 2,000,321 | $5,757,715 |
| 1952 | 1,140,217 | 1,638,833 | 2,991,019 | 12,098,420 |
| 1953 | 735,459 | 1,094,351 | 2,231,596 | 11,182,096 |
| 1954 | 744,393 | 1,330,873 | 1,927,285 | 5,858,756 |
| 1955 | 873,142 | 867,299 | 2,402,401 | 6,902,323 |
| 1956 | 891,894 | 899,399 | 2,657,815 | 8,016,220 |

**Lime.**—Lime production in 1956 advanced slightly over 1955, and value increased nearly 10 percent owing mainly to the rise in unit value from $9.84 per ton in 1955 to $10.67 per ton in 1956. Approximately 84 percent of the lime was used for chemical and industrial purposes, 10 percent in refractories, and 6 percent in building lime. Quicklime comprised 85 percent of lime production and hydrated lime, 15 percent. Six lime plants were active in 1956—2 in Greene County and 1 each in Marion, Newton, St. Francois, and Ste. Genevieve Counties.

**TABLE 16.—Lime (quick and hydrated) sold by producers, 1947–51 (average) and 1952–56** [1]

| Year | Quicklime (short tons) | Hydrated lime (short tons) | Total lime | |
|---|---|---|---|---|
| | | | Short tons | Value |
| 1947–51 (average) | 795,130 | 191,894 | 987,024 | $8,954,756 |
| 1952 | 949,572 | 181,398 | 1,130,970 | 11,326,941 |
| 1953 | 1,006,393 | 205,714 | 1,212,107 | 12,084,130 |
| 1954 | 917,684 | 208,235 | 1,125,919 | 11,165,381 |
| 1955 | 1,241,051 | 223,777 | 1,464,828 | 14,408,279 |
| 1956 | 1,254,447 | 227,164 | 1,481,611 | 15,813,573 |

[1] Includes lime used by producers.

**Nitrogen Compounds.**—Atmospheric nitrogen (anhydrous ammonia) plants were operated by Hercules Powder Co. at Louisiana, and Mississippi River Fuel Corp. at Crystal City.

**Iron Oxide Pigments.**—Crude iron oxide pigments were mined in Dent County in 1956. Production was reported by George B. Smith Chemical Works, Inc.

**Perlite.**—Perlite was expanded at a plant in St. Louis from crude rock mined in Western States and used mainly as a lightweight aggregate. Crude perlite is not known to occur in Missouri. Demand was down in 1956 due to a decrease in private housing.

Digitized by Google

**Sand and Gravel.**—Sand and gravel output of Missouri in 1956 was reported from 73 counties; St. Louis, Jefferson, St. Charles, Taney, and Lewis Counties led in value of production. The major use was as an aggregate for building and highway construction. Quality silica sand was obtained in Jefferson and St. Louis Counties and used in glass and other ceramic industries. Commercial operations furnished 85 percent of total tonnage and 88 percent of total value; Government-and-contractor operations supplied 15 percent of the tonnage and 12 percent of the value.

**TABLE 17.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Commercial | | Government-and-contractor | | Total sand and gravel | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Value | |
| | Short tons | Value | Short tons | Value | Short tons | Total | Average per ton |
| 1947–51 (average) | 4,937,964 | $4,445,584 | [1] 757,556 | [1] $436,086 | [1] 5,695,520 | [1] $4,882,570 | $0.86 |
| 1952 | 5,695,296 | 5,417,628 | 1,095,126 | 704,567 | 6,790,422 | 6,122,195 | .90 |
| 1953 | 4,932,617 | 4,770,451 | 859,441 | 463,548 | 5,792,058 | 5,233,999 | .90 |
| 1954 | 8,822,467 | 9,555,223 | 1,068,838 | 648,258 | 9,891,305 | 10,203,481 | 1.03 |
| 1955 | 8,352,467 | 8,789,439 | 1,631,157 | 1,191,439 | 9,983,624 | 9,980,878 | 1.00 |
| 1956 | 8,160,792 | 8,872,944 | 1,424,476 | 1,244,407 | 9,585,268 | 10,117,351 | 1.06 |

[1] Excludes Government-and-contractor production for 1947 to avoid disclosing individual company confidential data.

**Stone.**—Missouri production of stone in 1956 totaled 24.6 million tons valued at $33.6 million. Limestone, marble, granite, sandstone, and miscellaneous stone were quarried. Limestone, from over 200 producers, in 81 counties supplied 94 percent of the total stone production and 92 percent of total value. Crushed marble was obtained in Jefferson County and dimension marble in Jasper, Greene, and Ste. Genevieve Counties. Crushed and dimension granites were quarried in Iron County. Shannon, Wayne, and Camden Counties reported production of dimension sandstone. Miscellaneous stone (chats) was produced in Jasper, St. Francois, and Newton Counties. The principal uses for crushed stone were for concrete aggregate, roadstone, riprap, and agricultural stone. Dimension stone was used as monumental and building stone. Total 1956 stone tonnage comprised 90 percent commercial production and 10 percent noncommercial production.

Digitized by Google

TABLE 18.—Stone sold or used by producers, 1952–56, by kinds

| Year | Granite | | Marble | | Limestone | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | 11,618 | $149,196 | (1) | (1) | 12,709,705 | $18,877,717 |
| 1953 | 5,882 | 164,792 | 12,132 | $708,794 | 12,727,029 | 18,924,418 |
| 1954 | 3,827 | 169,935 | 22,893 | 1,067,742 | 17,770,749 | 22,913,657 |
| 1955 | 2,821 | 179,483 | [2] 8,500 | [2] 102,000 | 21,283,587 | 28,850,387 |
| 1956 | 3,456 | 301,857 | [2] 5,000 | [2] 25,000 | 23,152,644 | 31,051,285 |

| Year | Sandstone | | Miscellaneous stone [3] | | Total stone | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | (1) | (1) | 2,372,812 | $889,254 | 15,106,544 | $20,676,958 |
| 1953 | 10,972 | $23,413 | 1,191,819 | 731,423 | 13,947,834 | 20,552,840 |
| 1954 | 633 | 10,957 | 874,137 | 589,319 | 18,672,239 | 24,751,610 |
| 1955 | 3,036 | 59,407 | 1,070,824 | 389,137 | 22,368,768 | 29,580,414 |
| 1956 | (1) | (1) | 1,395,776 | 820,022 | 24,578,243 | 33,577,211 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Excludes dimension marble.
[3] Chats; also includes small quantity of stone.

**Tripoli.**—Tripoli was processed by American Tripoli Division of The Carborundum Co. at its Seneca plant in Newton County from ore quarried in Oklahoma. The company stated that demand declined from 1955. The processed tripoli was used for abrasive polishing and buffing compounds in the metal-finishing trades, as a chemically inert filler, and for foundry facings.

**Vermiculite.**—Vermiculite was exfoliated in St. Louis and Jackson Counties from crude material from Western States.

## MINERAL FUELS

**Asphalt (Native).**—Barton County Rock Asphalt Co. obtained native asphalt from its pit in Barton County. Production declined from 1955.

**Coal.**—Bituminous-coal production in Missouri in 1956 increased for the third consecutive year. Production of more than 1,000 tons each of coal was reported by 43 mines in 16 counties; 96 percent of the tonnage was supplied by 28 strip mines, and 4 percent was furnished by 15 underground mines. Production was valued at more than $1 million in 6 counties—Henry, Bates, Macon, Randolph, St. Clair, and Barton.

TABLE 19.—Coal production, 1947–51 (average) and 1952–56

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 3,627,747 | $14,095,166 | 1954 | 2,513,593 | $10,028,293 |
| 1952 | 2,954,450 | 12,048,141 | 1955 | 3,232,485 | 12,771,570 |
| 1953 | 2,393,304 | 9,848,903 | 1956 | 3,282,978 | 13,222,780 |

**Natural Gas.**—Quantities of natural gas were reported from several northwestern counties. Production approximated that in 1955.

**Petroleum.**—Output and value of petroleum declined in 1956 for the second consecutive year. Crude petroleum was recovered in the St. Louis area and near Tarkio in Atchison County.

Digitized by Google

## REVIEW BY COUNTIES

Mineral production was reported in 108 of the 114 counties in Missouri in 1956; 21 counties reported production of $1 million or more. The 5 principal producing counties—St. Francois, St. Louis, Ste. Genevieve, Jackson, and Washington—contributed 59 percent of the total mineral-production value. No mineral production was reported in Chariton, Mississippi, New Madrid, Ripley, Schuyler, and Scotland Counties.

**Adair.**—Coal was mined underground by Billy Creek Coal Co. Inc., Blacksmith Coal Co., Inc., and Number Eight Coal Co., Inc. Bailey Limestone Quarry produced crushed limestone for concrete aggregate, roadstone, and agricultural stone. Missouri State Highway Department obtained crushed limestone for road construction.

**Andrew.**—George W. Kerford Quarry and the United States Army Corps of Engineers quarried and crushed limestone for concrete aggregate and roadstone and for riprapping the banks of the Missouri River to stabilize the channel.

**TABLE 20.—Value of mineral production in Missouri by counties, 1955–56** [1]

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adair | $359,122 | $337,135 | Coal, stone. |
| Andrew | (2) | (2) | Stone. |
| Atchison | 37,549 | (2) | Petroleum. |
| Audrain | 1,431,046 | 1,357,854 | Clays, sand and gravel. |
| Barry | 22,210 | (2) | Stone. |
| Barton | (2) | (2) | Coal, native asphalt. |
| Bates | 2,954,108 | 2,794,933 | Coal, stone, sand and gravel. |
| Benton | (2) | (2) | Sand and gravel. |
| Bollinger | 37,159 | (2) | Do. |
| Boone | 649,607 | 655,614 | Stone, sand and gravel, clays, coal. |
| Buchanan | 275,184 | 302,444 | Stone, sand and gravel, clays. |
| Butler | 56,740 | (2) | Sand and gravel. |
| Caldwell | 120,312 | 161,103 | Stone. |
| Callaway | 2,127,155 | 1,988,183 | Clays, coal, stone, sand and gravel. |
| Camden | 10,700 | (2) | Sand and gravel, stone. |
| Cape Girardeau | 6,058,735 | 6,708,961 | Cement, stone, sand and gravel, clays. |
| Carroll | (2) | 8,169 | Sand and gravel, stone. |
| Carter | 33,300 | 400 | Sand and gravel. |
| Cass | 217,728 | 349,587 | Stone, clays. |
| Cedar | (2) | (2) | Stone. |
| Chariton | (2) | | |
| Christian | (2) | 8,000 | Stone. |
| Clark | (2) | (2) | Do. |
| Clay | 1,181,781 | 966,994 | Stone, coal. |
| Clinton | (2) | 117,627 | Stone. |
| Cole | 162,520 | 175,228 | Sand and gravel, stone. |
| Cooper | 110,391 | 116,890 | Do. |
| Crawford | (2) | 30,875 | Stone, sand and gravel, clays. |
| Dade | (2) | (2) | Stone, coal. |
| Dallas | 10,400 | 10,400 | Sand and gravel. |
| Daviess | (2) | (2) | Stone. |
| De Kalb | | 80,584 | Do. |
| Dent | 79,018 | 12,900 | Sand and gravel, stone, crude iron oxide pigments. |
| Douglas | 6,200 | 101,100 | Sand and gravel. |
| Dunklin | (2) | (2) | Stone, sand and gravel. |
| Franklin | 837,967 | 643,867 | Sand and gravel, stone, clays. |
| Gasconade | 2,200,196 | 2,555,923 | Clays, sand and gravel. |
| Gentry | 117,887 | 136,893 | Stone, sand and gravel. |
| Greene | 2,500,230 | 2,549,655 | Lime, stone, sand and gravel. |
| Grundy | (2) | (2) | Stone. |
| Harrison | 208,383 | 244,845 | Stone, sand and gravel, coal. |
| Henry | 3,445,858 | 3,904,361 | Coal, stone. |
| Hickory | (2) | (2) | Sand and gravel, stone. |
| Holt | (2) | 362,492 | Stone. |
| Howard | 132,634 | 238,481 | Stone, sand and gravel. |
| Howell | 214,060 | 430,740 | Iron ore, sand and gravel. |

See footnotes at end of table.

Digitized by Google

**TABLE 20.—Value of mineral production in Missouri by counties, 1955–56 [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Iron | $248,728 | $369,557 | Stone, sand and gravel. |
| Jackson | 9,066,124 | 8,773,826 | Cement, stone, sand and gravel, clays. |
| Jasper | 2,102,156 | 2,749,101 | Stone, sand and gravel, zinc, lead. |
| Jefferson | 978,513 | 1,088,656 | Sand and gravel, stone, barite. |
| Johnson | 240,382 | 185,819 | Stone. |
| Knox | (2) | (2) | Do. |
| Laclede | 29,075 | 36,258 | Sand and gravel, stone. |
| Lafayette | 169,166 | 225,621 | Coal, stone, sand and gravel. |
| Lawrence | 6,900 | (2) | Stone. |
| Lewis | 666,057 | (2) | Sand and gravel, stone. |
| Lincoln | 314,203 | 231,326 | Clays, stone, sand and gravel. |
| Linn | (2) | (2) | Stone. |
| Livingston | 246,244 | 260,490 | Stone, clays, sand and gravel. |
| Macon | (2) | (2) | Coal, stone. |
| Madison | 5,222,604 | 6,257,522 | Lead, copper, cobalt, nickel, sand and gravel, silver. |
| Maries | 52,577 | 196,066 | Clays, stone, sand and gravel. |
| Marion | 617,219 | 658,131 | Lime, stone, sand and gravel. |
| McDonald | 2,900 | 1,600 | Sand and gravel. |
| Mercer | 57,661 | 36,500 | Stone. |
| Miller | 21,242 | 79,128 | Sand and gravel, stone. |
| Moniteau | 45,300 | 39,550 | Stone, sand and gravel. |
| Monroe | 182,271 | 281,007 | Clays, stone, sand and gravel. |
| Montgomery | 626,409 | 679,084 | Do. |
| Morgan | 35,600 | 41,488 | Sand and gravel, stone. |
| Newton | 511,951 | 432,379 | Lime, stone, zinc. |
| Nodaway | (2) | (2) | Sand and gravel. |
| Oregon | 113,973 | 290,482 | Iron ore, stone, sand and gravel. |
| Osage | 382,426 | 293,017 | Clays, sand and gravel. |
| Ozark | 12,150 | 14,074 | Sand and gravel, iron ore. |
| Pemiscot | (2) | (2) | Sand and gravel. |
| Perry | 101,520 | (2) | Stone, sand and gravel. |
| Pettis | 476,000 | (2) | Stone. |
| Phelps | 172,136 | 202,110 | Clays, stone, sand and gravel. |
| Pike | 158,133 | 182,429 | Stone, sand and gravel. |
| Platte | 209,324 | 231,780 | Clays, stone. |
| Polk | 13,800 | 26,550 | Sand and gravel. |
| Pulaski | 67,665 | 54,100 | Do. |
| Putnam | 52,805 | 135,839 | Coal. |
| Ralls | 6,719,384 | 6,912,724 | Cement, stone, coal, sand and gravel. |
| Randolph | 502,928 | 1,728,423 | Coal, stone. |
| Ray | 144,864 | 191,539 | Stone. |
| Reynolds | 4,100 | (2) | Sand and gravel. |
| Ripley | (2) | | |
| St. Charles | 1,043,939 | 1,349,592 | Stone, sand and gravel. |
| St. Clair | 1,335,872 | 1,340,505 | Coal, stone, sand and gravel. |
| St. Francois | 39,976,287 | 40,036,036 | Lead, iron ore, stone, lime, zinc, copper, silver, sand and gravel. |
| St. Louis | 24,950,751 | 27,022,267 | Cement, sand and gravel, stone, clays, petroleum. |
| Ste. Genevieve | 11,757,545 | 13,379,958 | Lime, stone, sand and gravel. |
| Saline | 475,804 | 263,952 | Stone. |
| Scotland | (2) | | |
| Scott | (2) | (2) | Sand and gravel. |
| Shannon | 70,388 | 125,702 | Stone, iron ore, sand and gravel. |
| Shelby | (2) | (2) | Stone. |
| Stoddard | 174,290 | (2) | Sand and gravel. |
| Stone | 45,400 | 47,300 | Stone, sand and gravel. |
| Sullivan | (2) | 369,021 | Stone. |
| Taney | 352,800 | 513,800 | Sand and gravel. |
| Texas | 39,348 | 31,125 | Sand and gravel, stone. |
| Vernon | 235,191 | 312,246 | Coal, stone, sand and gravel. |
| Warren | 325,396 | 324,964 | Clays, stone, sand and gravel. |
| Washington | 5,782,647 | 8,154,007 | Barite, lead, zinc, sand and gravel. |
| Wayne | 143,199 | 213,247 | Stone, sand and gravel, iron ore. |
| Webster | 7,100 | 4,100 | Sand and gravel. |
| Worth | (2) | (2) | Stone. |
| Wright | 27,850 | 17,500 | Do. |
| Undistributed | 8,709,147 | 9,949,422 | |
| Total | 151,626,000 | 163,693,000 | |

[1] The following counties are not listed because no production was reported in 1955 or 1956: Mississippi, New Madrid, and Schuyler.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Digitized by Google

**Atchison.**—Petroleum was produced near Tarkio in Atchison County.

**Audrain.**—Audrain County, second in the State in clay production for the second consecutive year, reported production of fire clay for refractories. Producers included Mexico Refractories Co., A. P. Green Fire Brick Co., North American Refractories Co., Wellsville Fire Brick Co., Harbison-Walker Refractories Co., Laclede-Christy Co., and Walsh Refractories Corp. Molino Lime Co. mined paving gravel.

**Barry.**—Douthitt Lime Co. quarried and crushed limestone for soil conditioner.

**Barton.**—Clemens Coal Co., N. Coal Co., Inc., and John Zibert Coal Co. strip-mined coal. Barton County ranked sixth in the State in coal production. Native asphalt was obtained by Barton County Rock Asphalt Co.

**Bates.**—Bates County ranked second in the State in coal production for the second consecutive year. Coal was strip-mined by Peabody Coal Co. and Mullies Coal Co. Alvis Limestone & Concrete Co. and Frank Underwood quarried and crushed limestone for concrete roadstone, and agricultural purposes. Fuller Lime Co. and Clyde S. Miller produced building and paving gravels.

**Benton.**—Junge Gravel Co. obtained building, paving, and other gravels from deposits in Benton County.

**Bollinger.**—Mayfield Gravel Co. and Penzel Construction Co. obtained gravel for building and road construction.

**Boone.**—Limestone was quarried and crushed for concrete aggregate, roadstone, and riprap by Boone Quarries, Inc., N. R. Garrett, Adrian Materials Co., Central Stone Co., and the United States Army Corps of Engineers. Structural sand and gravel was produced by Columbia Sand & Towing Co. and the Columbia Special Road District. Columbia Brick & Tile Co. obtained shale and fire clay for use in heavy clay products. Coal was mined by William R. Carter and Earl S. Hussey.

**Buchanan.**—Everett Quarries, Inc., L. S. Stafford, Buchanan County Highway Department, and the United States Army Corps of Engineers quarried and crushed limestone for concrete aggregate, roadstone, agricultural stone, and riprap. Pioneer Sand Co. prepared building, paving, and engine sands. Moorhead Brick & Tile Co. quarried shale for common building brick and tile.

**Butler.**—Kittredge Gravel Co. and Grobe & Sons produced building and paving sand and gravel.

**Caldwell.**—Limestone was quarried and crushed for concrete aggregate, roadstone, and agricultural purposes by Farmers Rock & Lime Co., A. L. Houghton Stone Co., and the City of Braymer.

**Callaway.**—The county ranked third in the production value of clays in Missouri in 1956. Flint and plastic fire clays were mined for use in refractories. Leading producers included Harbison-Walker Refractories Co., Walsh Refractories Corp., A. P. Green Fire Brick Co., Laclede-Christy Co., and Clayton & Crawson. Marriott-Reed Coal Co. mined coal at its strip mine. Limestone was quarried and crushed by Auxvasse Stone & Gravel Co., Sulgrove Mining & Quarry Co., and Adrian Quarries, Inc., for concrete aggregate, roadstone, and agricultural stone. Paving gravel was obtained by Callaway County Highway Department and Missouri State Highway Department.

Digitized by Google

**Camden.**—Missouri State Highway Department contracted for paving gravel. Trio Stone Co. quarried dimension sandstone for use as undressed building stone.

**Cape Girardeau.**—The county ranked seventh in the value of Missouri mineral production in 1956. Federal Materials Co., Inc., and Farmers Limestone Co. quarried and crushed limestone for concrete aggregate, roadstone, riprap, railroad ballast, and agricultural purposes. Sand and gravel was produced for building and paving purposes by Cape Girardeau Sand Co., Inc., and Penzel Construction Co. Common red clay was mined by Ceramo Co., Inc., and Kasten Bros. Brick Co. for building brick, pottery, and stoneware. Marquette Cement Manufacturing Co. produced clay and limestone for cement. Portland and masonry cements were produced.

**Carroll.**—Paving sand was contracted for by the Missouri State Highway Department. Limestone was quarried for riprap by the United States Army Corps of Engineers.

**Carter.**—The Missouri State Highway Department produced paving gravel from county deposits.

**Cass.**—Deitz Hill Development Co., Peculiar Rock & Lime Co., Emmet Brosnahan Rock Co., and S & W Quarries produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Miscellaneous clay for brick and tile was mined by United Brick & Tile Co.

**Cedar.**—Alvis Limestone & Concrete Co. quarried and crushed limestone for concrete, roadstone, and agricultural purposes.

**Christian.**—Joe Howard quarried and crushed limestone near Billings for soil conditioner.

**Clark.**—Limestone was quarried and crushed for concrete aggregate, roadstone, and agricultural purposes. Producers included Myron Baker Construction Co., operating near Kahoka, and Brooks Construction Co.

**Clay.**—Clay County ranked seventh in the State in value of stone production. Crushed limestone, used mainly for riprap, concrete aggregate, and roadstone, was produced by Midwest Pre Cote Co., J. H. Oldham Stone Co., Tobin Quarries, Inc., Kansas City Quarries Co., Everett Quarries, Inc., Clay County Highway Engineer, and the United States Army Corps of Engineers. Mosby Coal Co. mined coal underground in Clay County.

**Clinton.**—Limestone was quarried and crushed by Everett Quarries, Inc., for concrete aggregate, roadstone, riprap, and agricultural purposes.

**Cole.**—Sand and gravel, obtained along the Osage and Missouri Rivers, was used mainly for building and paving. Producers included Jefferson City Sand Co., Adrian Materials Co., Thompson Sand Co., Cole County Highway Department, and Missouri State Highway Department. Limestone for riprap was quarried by the United States Army Corps of Engineers.

**Cooper.**—Building and paving sand and gravel were obtained from local deposits by Missouri River Sand & Gravel Co., Ralph V. Reuter, H. A. Harms, and Missouri State Highway Department for use mainly in building and paving. The United States Army Corps of Engineers obtained limestone for riprap from two quarries in the county.

Digitized by Google

**Crawford.**—Fire clay was mined for use by Laclede-Christy Co. in refractories under contract by Francis & Drewel. The Missouri State Highway Department contracted for paving gravel.

**Dade.**—George M. Baker quarried and crushed limestone for concrete aggregate, roadstone, and railroad ballast. Tyler Coal Co. mined coal from an open pit.

**Dallas.**—The Missouri State Highway Department contracted for paving gravel.

**Daviess.**—Snyder Quarries, Inc., quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes.

**De Kalb.**—Limestone was quarried and crushed by Everett Quarries, Inc., for concrete aggregate, roadstone, riprap, and agricultural purposes.

**Dent.**—The Missouri State Highway Department contracted for paving gravel. Limestone for soil conditioner was produced by Ozark Contractors, Inc. George B. Smith Chemical Works, Inc., produced crude iron oxide pigments.

**Douglas.**—Welton & Gray and the Missouri State Highway Department prepared paving gravel.

**Dunklin.**—Everett Quarries, Inc., quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Wilkey & Lankford, Inc., obtained paving gravel.

**Franklin.**—The county ranked sixth in the production value of sand and gravel in Missouri in 1956. Building and paving sand and gravel were produced by Meramec Sand & Gravel Co., Pacific Pebbles, Inc., Missouri State Highway Department, Washington Sand Co., Sullivan Sand & Gravel Co., O. E. Jessup, and Clifford Dewert. Limestone and dolomite were quarried and crushed for concrete aggregate, roadstone, and agricultural and riprap purposes at eight places in the county. Leading producers included Oliver L. Taetz Co., Inc., City of Washington, Edwin Bebermeyer, United States Army Corps of Engineers, and J. E. McKeever. A. P. Green Fire Brick Co. and Rousset Bros. Clay Co. mined diaspore and other fire clays for use in refractories.

**Gasconade.**—Gasconade County continued to lead the State in producing clays. Burley, flint, and diaspore fire clays were mined near Swiss, Hermann, Bland, and Owensville mainly for use in refractories. Producers included A. P. Green Fire Brick Co., General Refractories Co., Laughlin Bros., Harbison-Walker Refractories Co., North American Refractories Co., and Walsh Refractories Corp. Fire clay was mined by the General Chemical Division of Allied Chemical & Dye Corp. for chemical uses. The Missouri State Highway Department contracted for paving gravel.

**Gentry.**—Limestone was quarried and crushed for concrete, roadstone, and agricultural purposes by Gentry County Quarry and H. V. Windsor. Albany Gravel Co. obtained paving gravel from local deposits.

**Greene.**—Greene County ranked third in the State in value of lime production and sixth in value of stone production. Ash Grove Lime & Portland Cement Co. quarried limestone at its Galloway and Springfield quarries for use in lime and for concrete aggregate, roadstone, and soil conditioner. Quicklime and hydrated lime were produced for chemical, industrial, and building purposes. Garrett

Digitized by Google

Construction Co. and Joseph J. Griesemer produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Carthage Marble Corp. produced dressed and undressed marble from its quarry in Greene County. The Missouri State Highway Department contracted for paving gravel.

**Grundy.**—Jay Wilcox Limestone Quarry Co. and E. E. Trenary produced crushed limestone, mainly for concrete, roadstone, and agricultural purposes.

**Harrison.**—Mathes Quarries and L. W. Hayes, Inc., produced crushed limestone near Bethany and Ridgeway for concrete aggregate, roadstone, and as agricultural limestone. Mathes Quarries and Harrison County Highway Department produced paving gravel. Missouri State Highway Department produced paving sand. New Black Diamond Coal Co. mined coal underground in Harrison County.

**Henry.**—Henry County continued to lead in coal production in Missouri; 8 strip mines each produced 1,000 tons or more. Approximately 95 percent of the coal was shipped by rail to consumers, and 5 percent was shipped by truck. Producers included Peabody Coal Co., Windsor Coal Co., A. G. Pence Coal Co., Clary Coal Co., W. W. Coal Co., Inc., and Redding Coal Co. Crushed limestone for concrete aggregate roadstone, and agricultural purposes was produced by Williams Rock Co., Davis Rock Co., Alvis Limestone & Concrete Co., and O. A. Knisley.

**Hickory.**—Missouri State Highway Department contracted for paving gravel. Roy Worthington quarried and crushed limestone for soil conditioner.

**Holt.**—George W. Kerford produced limestone riprap.

**Howard.**—Glasgow Quarries and Armstrong Special Road District produced crushed limestone for concrete aggregate and roadstone. The United States Army Corps of Engineers produced limestone riprap. Glasgow Sand Co. obtained sand for building and other purposes.

**Howell.**—Iron-ore production in Howell County in 1956 more than tripled that in 1955 as the demand for brown iron ore by Alabama steel plants increased. A total of 13 mines was operated during the year. Leading producers included Patillo Bros., Four Mining Co., E. E. and E. H. Carroll, Mineral Point Mining Co., and Shook & Fletcher Supply Co. Missouri State Highway Department produced paving gravel.

**Iron.**—Heyward Granite Co. produced dimension granite for rough architectural and rough monumental purposes and granite for riprap. Dolomite was quarried by Duncan Bros. for use as agstone. The Missouri State Highway Department contracted for paving gravel.

**Jackson.**—Jackson County led the State in value of stone production, ranked 4th in total value of mineral production, and 7th in value of sand and gravel production. Limestone was quarried and crushed for concrete aggregate, roadstone, riprap, and agricultural purposes by 11 operators. Leading producers included Beyer Crushed Rock Co., Stewart Sand & Material Co., Centropolis Crusher Co., Union Construction Co., and Rock Acres Lime Co., Inc. Undressed dimension limestone for use as rubble was produced by Gerald Hodgins Building Rock Co., Dick Carson, McClain Stone Co., Strongs Quarries, and

Digitized by Google

Rove & Son. Dressed dimension limestone was produced by Dick Carson and Rove & Son. Stewart Sand & Material Co. dredged sand from the bed of the Missouri River for use in ready-mix concrete and for engine and other sands. United Brick & Tile Co. mined miscellaneous clay for use in heavy clay products. Missouri Portland Cement Co. quarried limestone and shale near Independence for portland and masonry cements.

**Jasper.**—The county ranked fourth in the value of stone produced in Missouri in 1956 for the second consecutive year. Carthage Marble Corp. quarried dimension marble for sale as undressed rough building stone, dressed building stone, and dressed monumental stone. Crushed limestone was produced by Carthage Crushed Limestone Co., Carthage Marble Corp., and Independent Gravel Co. for concrete aggregate, roadstone, agricultural, and other purposes. Miscellaneous stone (chats) was produced by American Zinc, Lead & Smelting Co., Independent Gravel Co., Calcium Products Co., and Jasper County Highway Department. Independent Gravel Co. mined and processed sand for use mainly as blast sand. Smaller quantities were used as glass, molding, grinding and polishing, furnace, engine, and filter sands. Potter-Sims Mines, Inc., obtained lead and zinc from ores mined in the county.

**Jefferson.**—This county ranked second in the State in sand and gravel production value in 1956. High-purity silica sand for use in plate glass and for grinding and polishing was quarried in the St. Peter formation by Aubuchon Silica Mining Co. near Festus and by Pittsburgh Plate Glass Co. near Crystal City. Building and paving sand and gravel were produced by Jefferson County Highway Department, Missouri State Highway Department, Walter Ficken, Masters Bros. Silica Sand Co., and Linus Miller. Crushed limestone and dolomite were produced by Henry Trautman, Kitson Bros. Quarry, Paul H. Giudicy, and Hess Bros. for concrete aggregate, roadstone, and agstone. Giudicy Marble Terrazzo & Tile Co. produced crushed limestone for agstone and crushed marble for terrazzo. Barite was produced by Burford Mining Co. Mississippi River Fuel Corp. operated its atmospheric nitrogen (anhydrous ammonia) plant at Crystal City.

**Johnson.**—Limestone was quarried and crushed by Deitz Hill Development Co. and Marr Bros. for concrete aggregate, roadstone, and as a soil conditioner.

**Knox.**—Knox County Stone Co., Inc., and McSorley Lime Co. quarried and crushed limestone for concrete, roadstone, and agricultural purposes.

**Laclede.**—The Missouri State Highway Department contracted for paving sand and gravel. Wissbaum Quarry produced crushed limestone for soil conditioner.

**Lafayette.**—Coal was mined underground by Earl Ashford Coal Co., Hughes Coal Co., H. S. Peek Coal Co., and Winfrey Mining Co.; the entire output was shipped to consumers by truck. Limestone was quarried for riprap by the United States Army Corps of Engineers and for concrete aggregate and roadstone by Deitz Hill Development Co. Waverly Sand Co. and Lexington Sand & Gravel Co. dredged sand for building and paving.

Digitized by Google

**Lawrence.**—Floyd Rose produced crushed limestone for use as a soil conditioner. E. L. Britain produced undressed dimension limestone for rough construction.

**Lewis.**—Lewis County ranked fifth in the State in value of sand and gravel production in 1956. Missouri Gravel Co. obtained building and paving sand and gravel from deposits near LaGrange. Hamill Limestone Co. and Missouri Gravel Co. quarried and crushed limestone for concrete aggregate, roadstone, and agricultural uses.

**Lincoln.**—Fire clay for refractories was mined by Harbison-Walker Refractories Co. Limestone was quarried and crushed for concrete aggregate, roadstone, riprap, and agricultural uses by Columbia Quarry Co., Gessman Lime Quarry, and Watson Quarry. The Missouri State Highway Department contracted for paving gravel.

**Linn.**—Limestone for concrete aggregate, roadstone, and agricultural purposes was quarried and crushed by Bailey Limestone Co.

**Livingston.**—Cooper Contracting Co. and Fred McVey produced crushed limestone for concrete aggregate, roadstone, riprap, and agricultural uses. Cooley Gravel Corp. obtained paving and railroad-ballast sands and building gravel from local deposits. Midland Brick & Tile Co. mined miscellaneous clay for use in brick and tile.

**Macon.**—Macon County ranked third in coal production in Missouri in 1956. Peabody Coal Co. strip-mined coal. Frank Trager produced crushed limestone for concrete aggregate and roadstone.

**Madison.**—National Lead Co. mined ores containing lead, copper, silver, cobalt, nickel, and iron at its Madison mine near Fredericktown. It recovered cobalt and nickel from iron rejects of the lead-copper circuit of its Madison mill at its refinery near Fredericktown. Ores containing lead, copper, and silver were mined near Mine La Motte by the Mine La Motte Corp. The Missouri State Highway Department contracted for paving gravel.

**Maries.**—A. P. Green Fire Brick Co., Wallace Bros., Laclede-Christy Co., and Harbison-Walker Refractories Co. mined diaspore, burley, and fire clays for refractories. Virgil Smith quarried and crushed limestone for concrete aggregate, roadstone, and agricultural uses. The Missouri State Highway Department contracted for paving gravel.

**Marion.**—Marblehead Lime Co. quarried limestone near Hannibal for quick and hydrated lime. S. D. Fessenden & Sons and Marblehead Lime Co. produced crushed limestone for soil conditioner. Building and blast sands were obtained from local deposits by Bolton Sand & Gravel Co.

**McDonald.**—The Missouri State Highway Department contracted for paving gravel in McDonald County.

**Mercer.**—The Missouri State Highway Department quarried and crushed limestone for roadstone and concrete aggregate.

**Miller.**—Gravel was obtained by C. W. Roweth Co. for railroad ballast and by the Missouri State Highway Department for paving. Franklin Groose produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes.

**Moniteau.**—Moniteau County Agricultural Association, Inc., quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Missouri State Highway Department contracted for paving gravel.

Digitized by Google

**Monroe.**—Monroe County ranked seventh in the State in the value of clays produced in 1956. Gilliam Mining Co., Walsh Refractories Corp., Bethlehem Co., and Fluetsch Bros. mined fire clay for use in refractories. Crushed limestone was produced by Hamilton Lime Co., Central Stone Co., and Ullmer Wilkerson for concrete aggregate, roadstone, and agricultural purposes. The Missouri State Highway Department and Monroe County Highway Department contracted for paving gravel.

**Montgomery.**—The county ranked fourth in the State in the value of clays produced. Fire clay was mined from local pits for refractories by A. B. Carter, Wellsville Fire Brick Co., General Refractories Co., and A. P. Green Fire Brick Co. McClain Lime Quarry and Danville Stone Co. produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Two Rivers Sand & Gravel Co. and the Missouri State Highway Department obtained building and paving sand and gravel.

**Morgan.**—The Missouri State Highway Department contracted for paving gravel. Limestone was quarried and crushed for soil conditioning by Harold Campbell at the Morgan County Lime Crusher.

**Newton.**—The county ranked fifth in the State in lime production. Quick and hydrated limes were produced near Neosho by Southwest Lime Co. from locally quarried limestone; a small quantity was sold for agstone. The Missouri State Highway Department produced crushed limestone for concrete aggregate and roadstone. Independent Gravel Co. produced miscellaneous stone. Ores containing zinc were mined by the A. B. J. Mining & Development Co. Tripoli for use in polishing and buffing compounds was processed at a plant near Seneca. The raw tripoli was shipped from Ottawa County, Okla.

**Nodaway.**—Earl Wilson Sand Co. dredged sand and gravel for building and other uses.

**Oregon.**—Miller & Reynolds, Ozark Mining Corp., Kilkenney Limestone Co., and A. T. Utley mined brown iron ore from open-pit mines. Limestone was quarried and crushed for concrete aggregate, roadstone, and agricultural purposes by O. O. Mainprize. The Missouri State Highway Department obtained paving gravel.

**Osage.**—Osage County ranked fifth in the State in the value of clay production. Fire clay was mined by Mexico Refractories Co., Harbison-Walker Refractories Co., A. P. Green Fire Brick Co., and Russell Phillips for manufacturing refractories. The Missouri State Highway Department contracted for paving sand. Osage County Highway Department obtained paving gravel.

**Ozark.**—Carter & Hamilton mined brown iron ore from deposits in Ozark County. Paving gravel was obtained by the Missouri State Highway Department and the Ozark County Highway Department.

**Pemiscot.**—Taylor Sand & Gravel Co. and Caruthersville Sand & Gravel Co. recovered building and paving sand and gravel.

**Perry.**—Crushed limestone for concrete aggregate, roadstone, and agricultural purposes and gravel for paving were produced by Gibbar Bros.

**Pettis.**—Howard Construction Co. quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes.

**Phelps.**—A. P. Green Fire Brick Co., Dillon Bros., and Robinson Clay Products Co. mined fire clay for refractories. Limestone was

Digitized by Google

quarried and crushed for concrete aggregate, roadstone, and agricultural purposes. Producers included Bray Construction Co., Jessie Nivens, and Brown, Lenox & Schafer. The Missouri State Highway Department contracted for paving gravel.

**Pike.**—Crushed limestone for concrete aggregate, roadstone, and agricultural purposes was produced by Magnesium Mining Co., Ashley Quarries, Inc., and Galloway Limestone Co. The Missouri State Highway Department contracted for paving gravel. Hercules Powder Co. operated its atmospheric nitrogen (anhydrous ammonia) plant at Louisiana.

**Platte.**—Carter-Waters Corp. mined miscellaneous clay for use in lightweight aggregates. The United States Army Corps of Engineers used broken and crushed limestone for stabilizing the banks of the Missouri River. Mid West Precote Co. and Everett Quarries, Inc., produced limestone for concrete aggregate and roadstone.

**Polk.**—H. F. Butcher obtained gravel from deposits near Humansville for building and paving. The Missouri State Highway Department contracted for paving gravel.

**Pulaski.**—Sand and gravel was obtained from local deposits by J. H. Walser Construction Co. near Waynesville and by the Missouri State Highway Department for building and paving.

**Putnam.**—Coal was mined underground by Clark Coal Co. and Hays Coal Co.; coal was strip-mined by Kirkville Coal Co. and Husted Bros. Coal Co.

**Ralls.**—Ralls County ranked second in the value of cement and sixth in total mineral production. Both portland and masonry cements were manufactured by Universal Atlas Cement Co. at its plant near Ilasco. Limestone and shale for cement were obtained near the plant. Central Stone Co. quarried and crushed limestone for concrete aggregate, roadstone, railroad ballast, and agricultural purposes. Paving gravel was mined by Edward B. Cooper. Maple Valley Coal Co. strip-mined coal.

**Randolph.**—The county ranked fourth in the State in coal production. Coal was mined underground by Moberly Fuel Co., D. L. Bradley Coal Co., Inc., Fateley Coal Co., and Nejedly Coal Co. Peabody Coal Co. operated a strip coal mine. N. J. Cooksey Co., Glasgow Quarries, Inc., Ralph Potter Quarry Co., and Alfred Vanskike Lime Quarry produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes.

**Ray.**—Limestone was quarried and crushed near Richmond by Steva Stone Co. and near Orrick by Orrick Stone for concrete aggregate, roadstone, and agricultural purposes. The United States Army Corps of Engineers produced limestone riprap.

**Reynolds.**—Penzel Construction Co. obtained paving gravel.

**St. Charles.**—St. Charles County ranked third in sand and gravel production value in Missouri in 1956. Tavern Rock Sand Co. obtained glass, molding, and other sands from local deposits. Paving gravel was produced by the Missouri State Highway Department and the St. Charles County Highway Department. St. Charles Quarry Co., O'Fallon Quarry, Joerling Bros., and Schiermeier Limestone Quarry produced crushed limestone, mainly for concrete aggregate, roadstone, riprap, and agricultural purposes. The United States Army Corps of

Digitized by Google

Engineers produced limestone for riprap. The O'Fallon Quarry produced undressed dimension limestone for rubble.

**St. Clair.**—The county ranked fifth in the State in coal production in 1956. Coal was recovered from strip mines by Pioneer Mining Corp. and Coones Coal Co. Limestone was quarried and crushed for concrete aggregate, roadstone, and agricultural purposes by Hunt Limestone Co. and Alvis Limestone Concrete Co. Joe Brinkman, Herman Schneider, and the Missouri State Highway Department obtained paving and building gravels.

**St. Francois.**—St. Francois County led Missouri in the value of total minerals produced and in lead, iron ore, silver, zinc; it ranked second in copper, stone, and lime production value. At Iron Mountain, Ozark Ore Co. mined hematite iron ore, which was shipped to steel furnaces. St. Joseph Lead Co. mined and milled lead ore (yielding zinc, copper, and silver as byproducts). Chats from lead and iron mining were used for concrete aggregate, roadstone, and railroad ballast. Valley Dolomite Corp. produced crushed dolomite for use as flux, as refractory material, and as a soil conditioner. The company also produced dead burned dolomite for building, refractory, chemical, and other industrial uses. St. Joseph Lead Co. quarried and crushed dolomite for agricultural and fluxing purposes. The Missouri State Highway Department contracted for paving gravel.

**Ste. Genevieve.**—The county was the leading lime producer, ranked third in the State in total value of mineral production, and ranked fifth in value of stone produced. Limestone was quarried and crushed by Mississippi Lime Co. of Missouri for quick and hydrated lime at its plant near Ste. Genevieve. Lime was used for chemical, industrial, and building purposes. The company sold limestone for glass, whiting, asphalt filler, coal-mine rock dust, poultry grit, concrete, riprap, and various purposes. Crushed and dimension limestone was produced by Ste. Genevieve Building Stone Co. and Ste. Genevieve Marble Co. and Weiler Marble Co., Inc., quarried dimension marble for use as undressed rough building stone. Bauman Bros. obtained sand and gravel for building and paving purposes.

**St. Louis.**—St. Louis County led in cement and sand and gravel production value, ranked second in total mineral production value, and was third in value of stone output. Crushed and dimension limestone was produced from quarries near Leman, Maplewood, and Clayton. Crushed stone was used for cement, roadstone, riprap, and agricultural purposes. Dimension stone was employed for curbing, flagging, and rough architectural uses. West Lake Quarry & Material Co. and Riverview Stone & Material Co. produced crushed and dimension limestone. Crushed limestone was also supplied by Vigus Quarries, Inc., Rock Hill Quarries Co., Des Peres Quarry, Bussen Quarries, Inc., F. Ruprecht & Sons, Fred Weber, and Orth Bros. Quarry. Portland and masonry cement were manufactured near Lemay by Alpha Portland Cement Co. and near Prospect Hill by Missouri Portland Cement Co. Glass, molding, grinding, and polishing sands were obtained from local deposits and sand and gravel for building and paving uses. Leading producers, in terms of value, were: Winter Bros. Materials Co., Inc., Missouri Aggregates, Inc., Dennis Materials Co., Pioneer Silica Products Co., and St. Charles Sand Co.

465877—58——43

Digitized by Google

Shale and plastic fire clay for heavy clay products and refractory brick were mined by Alton Brick Co., Hydraulic Press Brick Co., Thomas Mining Corp., Laclede-Christy Co., Evens & Howard Sewer Pipe Co., and Guth & Sons. Petroleum was produced.

**Saline.**—The United States Army Corps of Engineers operated five limestone quarries in Saline County in 1956. The stone was used to riprap the banks of the Missouri River. Duderstadt Construction Co. and Howard Construction Co. produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes and as a fertilizer filler.

**Scott.**—Sikeston Concrete Products Co., Inc., and Penzel Construction Co. obtained building sand and paving gravel, respectively.

**Shannon.**—Brown iron ore was mined by Ozark Mining Corp. at its open-pit mine in Shannon County. Crider Bros. quarried and crushed limestone for use as a soil conditioner. Ozark Stone Products, Inc., and Salem Stone Co. quarried dimension sandstone for rough architectural uses. Paving gravel was obtained by the Missouri State Highway Department.

**Shelby.**—Central Stone Co. and Turner Lime & Rock Quarry quarried limestone for concrete aggregate, roadstone, and agricultural uses.

**Stoddard.**—Building and paving sand and gravel were obtained by Brown Sand & Gravel Co., Hill & Stuart, Inc., and the Missouri State Highway Department.

**Stone.**—United States Army Corps of Engineers and the Missouri State Highway Department produced paving sand and gravel. Limestone was quarried and crushed for riprap by the United States Army Corps of Engineers.

**Sullivan.**—Limestone was quarried and crushed by Partin Lime & Rock Co., Howard Construction Co., and the Missouri State Highway Department for concrete aggregate, roadstone, and agricultural uses.

**Taney.**—Taney County ranked fourth in the State in the value of sand and gravel production in 1956. Sand and gravel was produced by the United States Army Corps of Engineers and the Missouri State Highway Department for use in road construction.

**Texas.**—Limestone was quarried and crushed by Long Bros. for soil conditioner. The Missouri State Highway Department obtained paving gravel.

**Vernon.**—Coal was strip-mined in Vernon County in 1956 by M. L. Schooley Coal & Construction Co., Ellis Coal Co., Thornhill Coal Co., and K & M Coal Co. Blue Mound Township Clerk produced paving gravel for road maintenance. Crushed limestone for concrete aggregate and roadstone was produced by R. E. Jones and Alvis Limestone & Concrete Co.

**Warren.**—The county ranked sixth in the State in value of clay production. Harbison-Walker Refractories Co., Walsh Refractories Corp., and Acme Mining Co. mined fire clay for refractories. Limestone for riprap, concrete aggregate, roadstone, and agricultural uses was quarried by Sprick Quarry and the United States Army Corps of Engineers.

Digitized by Google

**Washington.**—The county was the State's leading barite producer and ranked fifth in total mineral production value. Barite production was reported by 16 companies. Leading producers included Superbar Co., Baroid Division of National Lead Co., Magnet Cove Barium Corp., Mobar Corp., De Soto Mining Co., H & P Mining Co., and Midwest Mining Co. Lead ore, containing small quantities of zinc, was mined and milled by St. Joseph Lead Co. at its Indian Creek plant. Quantities of galena were recovered in mining and washing barite. Building sand and gravel was obtained by A. M. Mount. The Missouri State Highway Department contracted for paving gravel.

**Wayne.**—Williamsville Stone Co. quarried dimension sandstone for use as rubble and flagging. Limestone was quarried and crushed by Wm. Harris & Son Lime Quarry for use as agstone and by the Missouri State Highway Department for concrete aggregate and roadstone. Keener Gravel Co., Inc., obtained paving and building sand and gravel and railroad-ballast gravel. Brown iron ore was mined by Wayne County Mining Co.

**Webster.**—The Missouri State Highway Department contracted for paving gravel.

**Worth.**—Grand River Limestone Co. quarried and crushed limestone in Worth County for concrete aggregate, roadstone, and agricultural uses.

**Wright.**—Limestone was quarried and crushed for soil conditioner by Thomson Lime Co.

Digitized by Google

Digitized by Google

# The Mineral Industry of Montana

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Montana Bureau of Mines and Geology.

By Kenneth D. Baber,[1] Frank B. Fulkerson,[1] Norman S. Petersen,[1] and Albert J. Kauffman, Jr.[2]

RECORD production of petroleum and a new postwar high in copper output were the most important developments in the mineral industry of Montana in 1956.

The total value of mineral production ($214 million), continuing the rapid increase begun in 1955, advanced more than one-fourth and exceeded $200 million for the first time in State history. Copper and petroleum, which together supplied 65 percent of the State value, were responsible for the bulk of the $47 million increase. Net gain in production of mineral products other than copper and petroleum was $5 million.

Several commodities advanced significantly in output, including gold, fluorspar, lead, phosphate rock, silver, zinc, and cement. Production volume of sand and gravel was down and stone declined slightly but the values for these commodities increased substantially. Coal, manganese, and vermiculite declined in both quantity and value.

Metals accounted for 62 percent of the State total value; mineral fuels, 28 percent; and nonmetals, 10 percent. Compared with the 1955 totals for these groups, increases in value were: Metals, 23 percent; fuels, 50 percent; and nonmetals, 10 percent. A total of 31 mineral commodities was produced, and the first recovery of sulfur from refinery gases in the State was recorded.

**Trends and Markets.**—The market for copper—the State's principal mineral commodity—was featured by a high demand early in the year, followed by a decline in the market, accompanied by falling prices. The prices of electrolytic-refined copper, which had risen from 30 cents in January 1955 to 46 cents in early 1956, was cut to 40 cents in July and reduced further to 36 cents in October. Strikes at United States and foreign operations in 1955 were a major factor in the price increase of copper in that year, and the decrease in price in 1956 was caused by greater supplies of the metal from United States and foreign mines. Lead-zinc ore mining in Montana gained, owing to a slight price increase and settlement of a strike at one

[1] Commodity-industry analyst, Region I, Bureau of Mines, Albany, Oreg.
[2] Chief, Division of Mineral Industries, Region I, Bureau of Mines, Albany, Oreg.



Digitized by Google

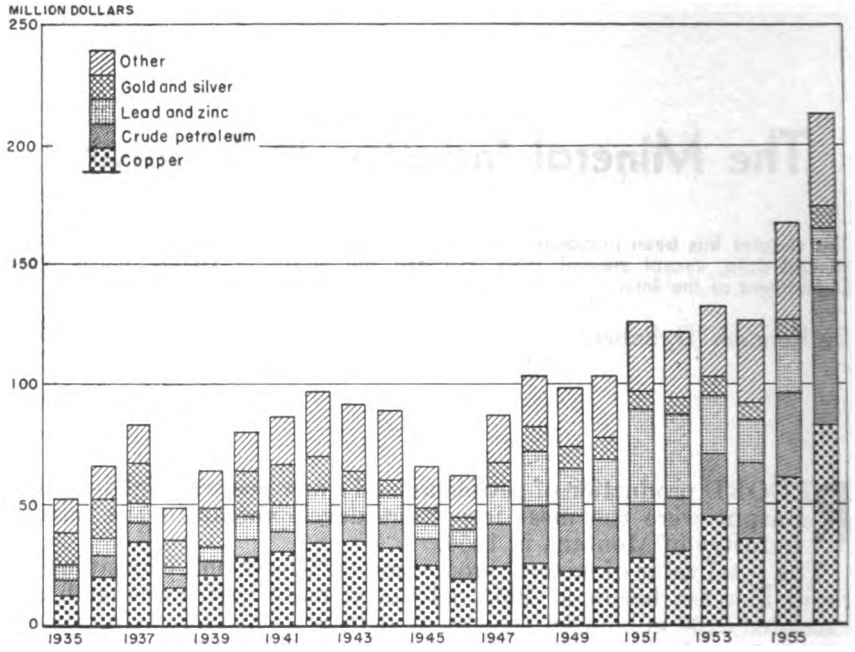



FIGURE 1.—Value of copper, crude petroleum, lead, zinc, gold, and silver, and total value of mineral production in Montana, 1935–56.

mine. Average prices for lead and zinc were up approximately 6 and 10 percent compared with 1955. The price of lead was stabilized at 16 cents after a drop of ½ cent per pound in January. The price of zinc increased ½ cent per pound to 13½ cents in the same month and remained at this figure for the remainder of the year. The demand for lead remained strong in 1956; but the market for zinc

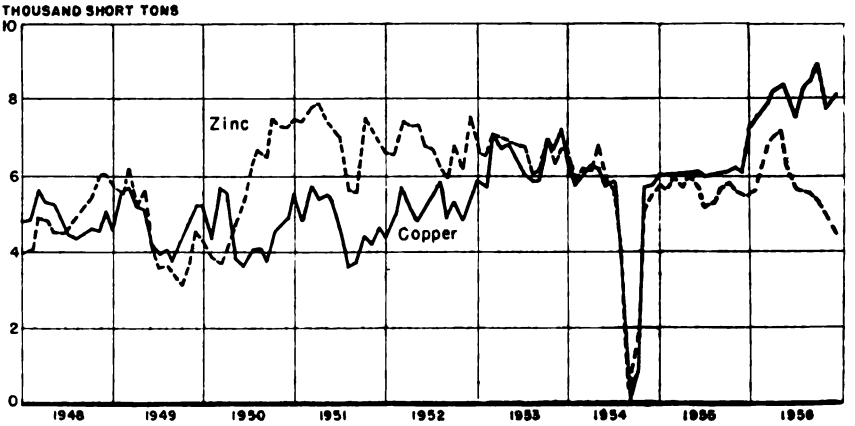



FIGURE 2.—Mine production of copper and zinc in Montana, 1948–56, by months, in terms of recoverable metals.

Digitized by Google

TABLE 1.—Mineral production in Montana, 1955–56 [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Chromium—gross weight | 118,703 | $3,718,882 | 118,780 | $3,806,926 |
| Clays | (2) | (2) | 33,074 | 31,005 |
| Coal: Bituminous and lignite | 1,247,253 | 3,781,879 | 846,134 | 3,468,000 |
| Copper (recoverable content of ores, etc.) | 81,542 | 60,830,332 | 96,426 | 81,962,100 |
| Fluorspar | 25,223 | (2) | 59,775 | (2) |
| Gold (recoverable content of ores, etc.)—troy ounces | 28,123 | 984,305 | 38,121 | 1,334,235 |
| Iron ore (usable)—long tons, gross weight | 6,631 | (2) | 11,643 | (2) |
| Lead (recoverable content of ores, etc.) | 17,028 | 5,074,344 | 18,642 | 5,853,588 |
| Manganese ore and concentrate (35 percent or more Mn)—gross weight | 106,026 | (3) | 80,553 | (3) |
| Manganiferous ore and concentrate (5 to 35 percent Mn) [3]—gross weight | 6,341 | (3) | 4,752 | (3) |
| Mica, sheet—pounds | | | 56 | 525 |
| Natural gas—million cubic feet | 28,255 | 1,724,000 | 25,847 | 1,758,000 |
| Petroleum (crude)—thousand 42-gallon barrels | 15,654 | 35,380,000 | 21,760 | 56,141,000 |
| Phosphate rock—long tons | (2) | (2) | 557,479 | 3,956,673 |
| Sand and gravel | 13,771,609 | 6,615,326 | 10,024,370 | 7,173,310 |
| Silver (recoverable content of ores, etc.)—troy ounces | 6,080,390 | 5,503,060 | 7,385,908 | 6,684,620 |
| Stone | 1,273,600 | 1,199,619 | 1,247,385 | 1,815,648 |
| Tungsten ore and concentrate (60-percent $WO_3$ basis) | 1,211 | (2) | 1,230 | (2) |
| Zinc (recoverable content of ores, etc.) | 68,588 | 16,872,648 | 70,520 | 19,322,480 |
| Value of items that cannot be disclosed: Barite, cement, gem stones, gypsum, lime, natural-gas liquids, pumice, pyrites, sulfur (1956), talc, vermiculite, and values indicated by footnote 2 | | 25,637,201 | | 21,325,443 |
| Total, Montana [4] | | 166,993,000 | | 213,728,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originated in Montana cannot be credited owing to lack of information (see last paragraph of introduction).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Production figures on manganiferous ores (less than 35 percent Mn) mined and shipped to Government stockpile depots not included in State totals (see text; section on manganese).
[4] Total has been adjusted to eliminate duplicating the value of stone.

weakened in midyear, and continued Government purchases for the national stockpile were instrumental in preventing a price decline.

At Butte a multi-million-dollar development program known as the Northwest project was just getting under way in 1956. Two new shafts—Ryan and Missoula—were to be sunk to enable development of huge copper and lead-zinc low-grade ore bodies in a previously undeveloped portion of Butte Hill, as well as to provide a more efficient method for handling the high-grade ore from the original mines at Butte. In addition, $7 million was assigned for purchase of equipment for the new Berkeley open-pit copper mine and $9 million for purchase of railroad rolling stock and enlargement of the metallurgical works at Anaconda. Expansion of Butte mining indicated a need for more than 1,000 additional miners by 1960.

The aluminum plant at Columbia Falls completed its first full year of operation. Operations at the plant were begun in August 1955. A large-scale mining enterprise was established at phosphate deposits in Beaverhead County on the Montana-Idaho line.

Production and exploration for crude oil increased. Record production of crude oil was reported, owing largely to an increase in volume from the Williston Basin. Output was stimulated by completion in 1955 of the Butte Pipeline from eastern Montana to Wyo-

Digitized by Google

ming to tie in with lines to the Midwest. Exports of crude oil more than doubled in 1956. Production by Montana refineries also increased owing to greater capacity. Construction continued at Sidney on an $8 million steam-electric plant, which was to use lignite as fuel.

The sharp decline in sand and gravel output and the small decrease in stone production resulted from completion of the Bureau of Reclamation Tiber Dam, which used huge tonnages of bank-run sand and gravel and broken stone as fill material. However, production of prepared sand and gravel and crushed stone, as well as cement output, was up in 1956, due primarily to expanded highway construction. Other heavy-construction projects that used large quantities of construction materials were the new airbase at Glasgow, expansion of airbase facilities at Great Falls, and the Sidney steam-electric plant. Initial construction was begun by electric-utility companies on the $85 million Noxon Rapids Dam on the Clark Fork River near Thompson Falls in northwestern Montana and the smaller Cochrane Dam on the Missouri River at Great Falls. These projects were expected to maintain cement production in Montana at capacity and increase the production of mineral aggregate for concrete.

Employment by construction contractors averaged 11,700 compared with 10,400 in 1955. In common with most States, residential building dropped in Montana, but commercial and industrial construction increased at the larger cities in the State. Value of construction authorized by building-permit issuing agencies in the State totaled $41.5 million, a 0.5-percent decrease. Sand and gravel, crushed stone, and other aggregate needed above normal requirements in 1957–59 for the new highway system in Montana were estimated by the National Crushed Stone Association as follows: 1957, 11,863,000 tons; 1958, 12,919,000 tons; and 1959, 14,280,000 tons.[3]

**Employment and Earnings.**—Average monthly employment in mining increased from 12,000 to 12,400, according to the Montana State Employment Service. Most of the gain was in metal mining, the State's largest nonagricultural industry. In mineral manufacturing the number of workers at primary metals plants increased from 4,300 to 4,600, while employment in petroleum refining was unchanged.

Average weekly earnings in metal mining and primary metals reached a record between January and October as the result of higher basic hourly rates, as well as a 6-day workweek in these industries; however, in late 1956 a 5-day week again prevailed in both industries. Average weekly earnings in primary metals were 8 percent above the average for all State manufacturing industries, while average weekly earnings in metal mining were slightly higher than in all mining.

Annual employment and payrolls in the mining undustry for the fiscal year 1956 (July 1, 1955–June 30, 1956) were published by the Unemployment Compensation Commission of Montana. The figures include extraction of fuels as well as metal and nonmetal mining and quarrying. A sharp increase was registered over the fiscal 1955 strike-reduced totals, with the number of wage earners gaining 14 percent, payrolls increasing 33 percent, and the wage level (average earnings per full-time equivalent employee) advancing 17 percent.

[3] Rock Products, vol. 60, No. 1, January 1957, pp. 78–79.

Digitized by Google

**TABLE 2.—Employment in mining, primary metals, and petroleum refining, 1947–51 (average) and 1952–56 [1]**

| | Total mining | Metal mining | Nonmetallic, including coal | Petroleum and natural gas | Processing | |
|---|---|---|---|---|---|---|
| | | | | | Primary metals | Petroleum refining |
| 1947–51 (average) | 10,100 | 7,400 | 1,400 | 1,300 | 4,100 | (2) |
| 1952 | 11,400 | 8,200 | 1,100 | 2,100 | 3,600 | (2) |
| 1953 | 11,600 | 8,200 | 1,000 | 2,400 | 3,600 | 1,200 |
| 1954 | 10,700 | 7,400 | 900 | 2,400 | 3,300 | 1,200 |
| 1955 | 12,000 | 8,400 | 900 | 2,700 | 4,300 | 1,200 |
| 1956: | | | | | | |
| January | 12,400 | 8,900 | 900 | 2,600 | 4,500 | 1,200 |
| February | 12,100 | 8,800 | 900 | 2,400 | 4,600 | 1,100 |
| March | 12,100 | 8,800 | 800 | 2,500 | 4,500 | 1,200 |
| April | 12,300 | 8,800 | 800 | 2,700 | 4,500 | 1,200 |
| May | 12,200 | 8,600 | 800 | 2,800 | 4,500 | 1,200 |
| June | 12,500 | 8,600 | 900 | 3,000 | 4,600 | 1,200 |
| July | 12,100 | 8,300 | 900 | 2,900 | 4,700 | 1,200 |
| August | 12,500 | 8,700 | 900 | 2,900 | 4,800 | 1,200 |
| September | 12,800 | 8,800 | 1,000 | 3,000 | 4,800 | 1,200 |
| October | 12,200 | 8,600 | 1,000 | 2,600 | 4,700 | 1,300 |
| November | 12,500 | 8,700 | 1,000 | 2,800 | 4,800 | 1,200 |
| December | 12,800 | 9,000 | 900 | 2,900 | 5,000 | 1,200 |
| Year (average) | 12,400 | 8,700 | 900 | 2,800 | 4,600 | 1,200 |

[1] Montana State Employment Service. Estimates in this series, which was begun in 1947, are published monthly in the Montana Labor Market and revised annually on the basis of more complete data. Data include all full- and part-time wage and salary workers who worked or received pay during the pay period ending the 15th of the month. Excludes proprietors and self-employed.
[2] Figures not published before 1953.

The number of employers remained about the same as in the previous year. Comparing the 1956 totals with those for 1950, the number of wage earners, payrolls, and the wage level increased 29, 107, and 61 percent, respectively.

Mining consistently held top position among the State's industries in average wages in the last decade except in 1950, when average earnings in the construction industry were higher. The average number of wage earners and wages in mining in leading counties were as follows in fiscal 1956: Silver Bow, 6,815 and $37.7 million; Yellowstone, 897 and $5.3 million; Deer Lodge, 988 and $5.4 million; Glacier, 451 and $2.2 million; and Stillwater, 331 and $1.9 million.

**TABLE 3.—Average weekly earnings, weekly hours, and hourly earnings of workers in selected industries, 1950–56 [1]**

| | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|
| Average weekly earnings: | | | | | | | |
| Manufacturing | $64.58 | $72.13 | $79.46 | $79.76 | $79.20 | $85.66 | $91.30 |
| Primary metals | 60.87 | 75.75 | 83.99 | 87.64 | 75.69 | 84.95 | 08.89 |
| Mining | 67.27 | 79.84 | 85.74 | 90.81 | 81.93 | 91.63 | 102.77 |
| Metal mining | 64.98 | 78.37 | 85.27 | 91.23 | 77.43 | 90.77 | 103.41 |
| Average weekly hours: | | | | | | | |
| Manufacturing | 40.1 | 41.2 | 41.0 | 41.4 | 39.9 | 41.3 | 41.3 |
| Primary metals | 40.4 | 45.0 | 45.4 | 45.1 | 39.4 | 41.5 | 44.1 |
| Mining | 39.1 | 42.3 | 41.4 | 41.6 | 38.1 | 40.3 | 41.7 |
| Metal mining | 38.9 | 42.6 | 41.9 | 42.6 | 37.1 | 40.3 | 42.2 |
| Average hourly earnings: | | | | | | | |
| Manufacturing | $1.61 | $1.75 | $1.86 | $1.93 | $1.99 | $2.08 | $2.21 |
| Primary metals | 1.51 | 1.68 | 1.85 | 1.95 | 1.92 | 2.05 | 2.24 |
| Mining | 1.72 | 1.89 | 2.07 | 2.18 | 2.15 | 2.28 | 2.47 |
| Metal mining | 1.67 | 1.84 | 2.03 | 2.14 | 2.09 | 2.25 | 2.45 |

[1] Montana State Employment Service. Estimates in this series, which was begun in 1950, are published monthly in the Montana Labor Market and revised annually on the basis of more complete data. Hours and earnings data exclude administrative and salaried personnel. Average weekly and hourly earnings include overtime and other premium pay, not to be confused with rate of pay.

Digitized by Google

**TABLE 4.—Employers, wage earners, and wages in mining, fiscal years 1950–56** [1]

| Fiscal year | Average number of employers | Average number of wage earners | Wages | Average wage level |
|---|---|---|---|---|
| 1950 | 463 | 9,483 | $31,502,931 | $3,322 |
| 1951 | 458 | 10,561 | 41,470,947 | 3,927 |
| 1952 | 474 | 10,562 | 46,941,121 | 4,444 |
| 1953 | 517 | 11,406 | 53,308,193 | 4,674 |
| 1954 | 528 | 11,635 | 54,105,365 | 4,650 |
| 1955 | 524 | 10,710 | 49,036,402 | 4,578 |
| 1956 | 528 | 12,193 | 65,154,932 | 5,344 |

[1] Unemployment Compensation Commission of Montana. Data on a fiscal year basis are published annually in the Montana Labor Market in a report that deals only with industries and employment covered under unemployment insurance laws of Montana. All mining establishments are subject to the State system of unemployment insurance.

**TABLE 5.—Defense Minerals Exploration Administration contracts active during 1956**

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total amount | Government participation, percent |
| BROADWATER | | | | | |
| Hogan and Pohl | Silver Saddle | Lead | June 6, 1955 | $16,460 | 50 |
| Pohl and Hogan, et al | January | Lead, zinc, copper. | Jan. 28, 1952 | 36,449 | 50 |
| CASCADE | | | | | |
| Boss Mines, Inc. | Boss & Atlantus | Lead, zinc | Sept. 18, 1956 | 57,208 | 50 |
| DEER LODGE | | | | | |
| Tip Top Mining Co. | Tip Top | Tungsten | Aug. 28, 1956 | 16,540 | 75 |
| FALLON | | | | | |
| Burmac Exploration Corp. | Cox Lease | Uranium | July 5, 1956 | 15,512 | 75 |
| GALLATIN | | | | | |
| Daniel T. Barham, et al | Thumper Lode | Mica | Sept. 15, 1955 | 14,000 | 75 |
| GRANITE | | | | | |
| American Machine & Metals, Inc. | Mullen | Manganese | Dec. 15, 1953 | 89,460 | 75 |
| Peter Antonioli | Scratch All | Manganese, lead, zinc. | July 28, 1954 | 128,320 | 62½ |
| Jennie M. Moore | Mystery Manganese. | Manganese | Apr. 12, 1955 | 55,620 | 75 |
| Taylor-Knapp Co. | True Fissure & Durango. | do | Feb. 1, 1954 | 648,727 | 75 |
| JEFFERSON | | | | | |
| George Hoffman | White Pine | Uranium | May 18, 1955 | 26,025 | 75 |
| SILVER BOW | | | | | |
| Umont Mining, Inc. (assignee of Irving & Nelson). | Plutus & Norwich. | Manganese | Sept. 19, 1956 | 106,010 | 75 |

**Defense Minerals Exploration Administration Program.**—Projects of the Defense Minerals Exploration Administration (DMEA) program to assist in the systematic investigation of strategic and critical mineral occurrences were active as follows: 4 manganese, 2 uranium,

Digitized by Google

and 1 each for lead, lead-zinc, lead-zinc-copper, manganese-lead-zinc, mica, and tungsten.

In addition to the mineral values credited to Montana, some were omitted owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, selenium, tellurium, gallium, and germanium. The quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues obtained from refining such metals as copper and lead and those obtained in other ways. It is not possible in many instances to allocate the mineral products by State or origin; sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value, the production of which usually cannot be separated as to source, is byproduct sulfuric acid.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Aluminum.**—Activity in Montana in connection with the new aluminum industry was carried out by The Anaconda Co. and subsidiaries at Columbia Falls, Great Falls, and Anaconda. The aluminum-reduction plant of Anaconda Aluminum Co. at Columbia Falls completed its first full operating year, and production (61,512 tons) exceeded the rated capacity of 60,000 tons of metal annually. The Anaconda Co. annual report also stated that metal quality and other operating results fully met all expectations. A long-term contract was completed with Kaiser Aluminum & Chemical Corp. to obtain alumina from Kaiser's alumina plant at Gramercy, La., after expiration of a supply agreement with Reynolds Metals Co. Anaconda Aluminum Co. was to advance $17 million to provide part of the cost of expanding the Louisiana plant. This advance was to be liquidated through credits on alumina purchased by Anaconda. The contract, which was to run a minimum of 12 years and a maximum of 15 years, assured a supply of alumina for the Columbia Falls smelter for an extended period.

Production of aluminum in the Pacific Northwest reached a record high in 1956 owing to activation of the Columbia Falls plant as well as to expansion of established plants. Washington, supplying the bulk of the output, produced 486,000 tons of aluminum at 5 reduction works. Oregon had one plant in operation and another under construction.

Anaconda Wire & Cable Co. operated its new semiautomatic aluminum-rod rolling mill at Great Falls throughout 1956. The plant supplied the requirements of all company plants for aluminum rod.

At the Anaconda Reduction Works, a test plant was set up and successfully recovered refined alumina from Idaho clays. A pilot plant, with a capacity of 50 tons of clay per day, was under construction at a cost of $1 million to obtain data on the operating costs, methods, and equipment necessary to produce alumina from clay on a commercial basis. Reports indicated that successful results might

Digitized by Google

lead to the establishment of a $10 million aluminum oxide plant at Moscow, Idaho, to process clay from the huge deposits in that area. The process was to involve calcination with natural gas (which became available in 1956 through completion of a pipeline), leaching, and high-pressure filtration. The project would lead to reduction of costly long-haul transportation charges for the Columbia Falls smelter as well as provide The Anaconda Co. and affiliated firms with a completely integrated operation of mining, processing, and fabricating.

**Chromite.**—Production of chromite concentrate by the American Chrome Co. at the Mouat mine (Stillwater County) totaled 114,021 short dry tons (estimated gross weight, 118,780 short tons). Total quantity delivered to the General Services Administration (GSA) at the end of 1956 was 372,289 tons, leaving a balance of 527,711 tons to be delivered through 1961. Renegotiation of the company contract with the Government resulted in establishing a price of $33.32 per ton for the first 9 months of 1956, after which the price was advanced to $33.60 through escalation provisions of the contract to cover, in part, increased costs at the mine. The annual report of the American Chrome Co. disclosed that the increased prices in 1956, combined with improved operating efficiency, resulted in earnings of $344,246 at the Mouat mine compared with $110,819 for 1955. It was planned to continue production in 1957 at approximately the same rate as in 1956. The company, continuing a research and development program, was completing studies that might lead to establishing a ferrochromium-smelting operation at the mine site.

**TABLE 6.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total 1862–1956, in terms of recoverable metals [1]**

| Year | Mines producing | | Material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 243 | 38 | 3,258,033 | 59,641 | $2,087,435 | 6,513,689 | $5,895,154 |
| 1952 | 164 | 9 | 4,625,750 | 24,161 | 845,635 | 6,138,185 | 5,555,367 |
| 1953 | 142 | 7 | 6,101,348 | 24,768 | 866,880 | 6,689,556 | 6,054,386 |
| 1954 | 113 | 11 | 5,104,288 | 23,660 | 828,100 | 5,177,942 | 4,686,299 |
| 1955 | 100 | 12 | 7,259,917 | 28,123 | 984,305 | 6,080,390 | 5,503,060 |
| 1956 | 152 | 7 | 9,535,789 | 38,121 | 1,334,235 | 7,385,908 | 6,684,620 |
| 1862–1956 | | | [3] | 17,489,159 | 396,573,777 | 813,190,250 | 605,035,553 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 56,929 | $24,470,291 | 18,687 | $5,916,812 | 62,440 | $18,115,013 | $56,484,705 |
| 1952 | 61,948 | 29,982,832 | 21,279 | 6,851,838 | 82,185 | 27,285,420 | 70,521,092 |
| 1953 | 77,617 | 44,552,158 | 19,949 | 5,226,638 | 80,271 | 18,462,330 | 75,162,392 |
| 1954 | 59,349 | 35,015,910 | 14,820 | 4,060,680 | 60,952 | 13,165,632 | 57,756,621 |
| 1955 | 81,542 | 60,830,332 | 17,028 | 5,074,344 | 68,588 | 16,872,648 | 89,264,689 |
| 1956 | 96,426 | 81,962,100 | 18,642 | 5,853,588 | 70,520 | 19,322,480 | 115,157,023 |
| 1862–1956 | 7,239,882 | 2,276,495,460 | 880,152 | 133,915,784 | 2,537,002 | 475,106,416 | 3,887,126,990 |

[1] Includes recoverable metal content of gravel washed (placer operation), ore milled, old tailings re-treated, and ore, old slag, and copper precipitates shipped to smelters during calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

Digitized by Google

Litigation resulting from a Federal Government "declaration of taking" which involved the Mouat mine was resolved during the year with payment of $241,001 to M. W. Mouat and other owners. After Government seizure during World War II as a strategic mineral property, the mine was operated by The Anaconda Co. under a Government contract, and a $13 million mill was built. The operation later was abandoned with the easing of shipping hazards from enemy submarine activity that threatened chromite supply.

**TABLE 7.—Gold produced at placer mines, 1947–51 (average) and 1952–56, by classes of mines and methods of recovery**

| Class and method | Mines producing [1] | Material treated (cubic yards) | Gold recovered | | Average value per cubic yard |
|---|---|---|---|---|---|
| | | | Fine ounces | Value | |
| Surface placers: | | | | | |
| Gravel mechanically handled: | | | | | |
| Bucketline dredges: | | | | | |
| 1947–51 (average) | 2 | 2,531,138 | 9,277 | $324,695 | $0.128 |
| 1952 | | | | | |
| 1953 | | | | | |
| 1954 | | | | | |
| 1955 | 1 | 447,000 | 1,764 | 61,740 | .138 |
| 1956 | 1 | 36,800 | 339 | 11,865 | .322 |
| Dragline dredges: | | | | | |
| 1947–51 (average) | 2 | 245,693 | 725 | 25,368 | .103 |
| 1952 | 1 | 250 | 46 | 1,610 | 6.440 |
| 1953 | | | | | |
| 1954 | 2 | 82,500 | 1,394 | 48,790 | .591 |
| 1955 | 4 | 123,000 | 1,443 | 50,505 | .411 |
| 1956 [2] | 2 | 219,150 | 1,025 | 35,875 | .164 |
| Nonfloating washing plants: [3] | | | | | |
| 1947–51 (average) | 7 | 279,069 | 1,440 | 50,414 | .181 |
| 1952 | | | | | |
| 1953 | 3 | 42,500 | 1,216 | 42,560 | 1.001 |
| 1954 | 2 | 3,950 | 79 | 2,765 | .700 |
| 1955 | 2 | 10,700 | 84 | 2,940 | .275 |
| 1956 | | | | | |
| Gravel hydraulically handled: | | | | | |
| 1947–51 (average) | 1 | 4,186 | 65 | 2,261 | .540 |
| 1952 | 1 | 600 | 9 | 315 | .525 |
| 1953 | | | | | |
| 1954 | | | | | |
| 1955 | 1 | 200 | 4 | 140 | .700 |
| 1956 | 2 | 11,000 | 119 | 4,165 | .379 |
| Small-scale hand methods: [4] | | | | | |
| 1947–51 (average) | 25 | 7,632 | 124 | 4,333 | .569 |
| 1952 | 7 | 2,500 | 23 | 805 | .322 |
| 1953 | 4 | 400 | 7 | 245 | .613 |
| 1954 | 6 | 1,350 | 53 | 1,855 | 1.374 |
| 1955 | 4 | 50 | 57 | 1,995 | 39.900 |
| 1956 | 2 | 437 | 13 | 455 | 1.041 |
| Underground placers: Drift: | | | | | |
| 1947–51 (average) | 2 | 516 | 30 | 1,057 | 2.048 |
| 1952 | | | | | |
| 1953 | | | | | |
| 1954 | 1 | 200 | 3 | 105 | .525 |
| 1955 | | | | | |
| 1956 | | | | | |
| Grand total placers: | | | | | |
| 1947–51 (average) | 39 | 3,068,234 | 11,661 | 408,128 | .133 |
| 1952 | 9 | 3,350 | 78 | 2,730 | .815 |
| 1953 | 7 | 42,900 | 1,223 | 42,805 | .998 |
| 1954 | 11 | 88,000 | 1,529 | 53,515 | .608 |
| 1955 | 12 | 580,950 | 3,352 | 117,320 | .202 |
| 1956 | 7 | 267,387 | 1,496 | 52,360 | .196 |

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Includes dragline dredges and nonfloating washing plants for which production cannot be individually published.
[3] Includes all placer operations using power excavator and washing plant, both on dry land; and outfit with movable washing plant in termed a "dry-land dredge."
[4] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Montana.

Digitized by Google

**Copper.**—Copper production increased 18 percent above the 1955 total. The 1956 output of 96,000 tons of metal was the largest annual yield since the war year of 1944. Virtually all of the ore was mined at the Butte Hill operations of The Anaconda Co. in Silver Bow County. Minor contributions to the State total were reported by several smaller operations in other areas of Montana. The smaller operators produced almost entirely from lead and lead-zinc ores. U & W Uranium Co. reported development of the open-pit Royal copper mine in the Coloma district, Missoula County, after leasing the mine in midyear.

Operations were not interrupted by labor difficulties throughout 1956. The immediate future appeared assured in that respect when negotiations by The Anaconda Co. and the International Union of Mine, Mill & Smelter Workers agreed to a 3-year wage pact which could not be reopened during the contract period. Anaconda was the second major copper producer to reach an agreement with the Mine-Mill union.

**TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals**

| County | Mines producing | | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|
| | Lode | Placer | Fine ounces | Value | Fine ounces | Value |
| Beaverhead | 10 | | 468 | $16,380 | 24,992 | $22,619 |
| Broadwater | 17 | 1 | 1,028 | 35,980 | 4,043 | 3,659 |
| Cascade | 4 | | | | 26,815 | 24,269 |
| Granite | 6 | | 478 | 16,730 | 413,380 | 374,130 |
| Jefferson | 30 | | 2,824 | 98,840 | 86,657 | 78,429 |
| Lewis and Clark | 14 | | 178 | 6,230 | 22,606 | 20,460 |
| Madison | 14 | | 114 | 3,990 | 742 | 672 |
| Mineral | 5 | 3 | 1,092 | 38,220 | 756 | 684 |
| Missoula | 5 | | 62 | 2,170 | 620 | 561 |
| Powell | 10 | 2 | 378 | 13,230 | 540 | 489 |
| Sanders | 2 | | 26 | 910 | 14,117 | 12,777 |
| Silver Bow | 21 | | 31,132 | 1,089,620 | 6,772,380 | 6,129,346 |
| Undistributed [1] | 14 | 1 | 341 | 11,935 | 18,260 | 16,525 |
| Total | 152 | 7 | 38,121 | 1,334,235 | 7,385,908 | 6,684,620 |

| County | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| Beaverhead | 15 | $12,750 | 540 | $169,560 | 72 | $19,728 | $241,037 |
| Broadwater | 1 | 850 | 29 | 9,106 | 31 | 8,494 | 58,089 |
| Cascade | | | 24 | 7,536 | 25 | 6,850 | 38,655 |
| Granite | 33 | 28,050 | 554 | 173,956 | 2,046 | 560,604 | 1,153,470 |
| Jefferson | 23 | 19,550 | 374 | 117,436 | 127 | 34,798 | 349,053 |
| Lewis and Clark | 37 | 31,450 | 813 | 255,282 | 4,411 | 1,208,614 | 1,522,036 |
| Madison | | | 7 | 2,198 | 1 | 274 | 7,134 |
| Mineral | 1 | 850 | 6 | 1,884 | 1 | 274 | 41,912 |
| Missoula | 1 | 850 | 5 | 1,570 | | | 5,151 |
| Powell | | | 5 | 1,570 | 2 | 548 | 16,837 |
| Sanders | 16 | 13,600 | 1,258 | 395,012 | 419 | 114,806 | 537,105 |
| Silver Bow | 96,292 | 81,848,200 | 14,989 | 4,706,546 | 63,375 | 17,364,750 | 111,138,462 |
| Undistributed [1] | 7 | 5,950 | 38 | 11,932 | 10 | 2,740 | 49,082 |
| Total | 96,426 | 81,962,100 | 18,642 | 5,853,568 | 70,520 | 19,322,480 | 115,157,023 |

[1] Includes values and quantities that cannot be shown separately for Fergus, Flathead, Judith Basin, Lincoln, Meagher, Park, Phillips, Ravalli, and Sweet Grass Counties.

Digitized by Google

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 1,700 | 498,702 | 7,324 | 1,082 | 5,429 |
| February | 2,130 | 584,312 | 7,678 | 1,314 | 5,653 |
| March | 2,050 | 639,986 | 7,965 | 1,536 | 6,833 |
| April | 2,340 | 663,586 | 8,252 | 2,012 | 7,135 |
| May | 2,850 | 663,259 | 8,440 | 1,981 | 7,245 |
| June | 2,690 | 643,855 | 7,959 | 1,822 | 6,375 |
| July | 2,670 | 557,927 | 7,434 | 1,638 | 5,726 |
| August | 3,020 | 608,382 | 8,295 | 1,682 | 5,634 |
| September | 3,650 | 637,331 | 8,375 | 1,434 | 5,588 |
| October | 5,547 | 709,568 | 8,926 | 1,582 | 5,414 |
| November | 4,775 | 583,220 | 7,739 | 1,257 | 4,983 |
| December | 4,699 | 595,780 | 8,039 | 1,302 | 4,505 |
| Total | 38,121 | 7,385,908 | 96,426 | 18,642 | 70,520 |

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals**

| Source | Number of mines[1] | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Ore: | | | | | | | |
| Dry gold | 38 | 10,159 | 2,355 | 4,909 | 1,300 | 29,700 | 18,800 |
| Dry gold-silver | 16 | 16,245 | 852 | 77,116 | 17,500 | 581,400 | 159,500 |
| Dry silver | 20 | 152,955 | 3,982 | 785,880 | 13,317 | 60,000 | 96,600 |
| Total | 74 | 179,359 | 7,189 | 867,905 | 32,117 | 671,100 | 274,900 |
| Copper | 16 | 7,782,458 | 13,540 | 3,033,314 | 183,804,804 | | |
| Copper-lead | 1 | 4,900 | 970 | 5,168 | 15,400 | 33,700 | 4,000 |
| Copper-lead-zinc | 1 | 70 | 1 | 1,836 | 8,400 | 9,100 | 7,600 |
| Lead | 39 | 10,699 | 643 | 54,753 | 96,500 | 2,545,800 | 305,200 |
| Lead-zinc | 23 | 1,496,700 | 13,955 | 3,337,077 | 5,674,862 | 32,697,500 | 129,778,900 |
| Zinc | 4 | 11,033 | 150 | 83,904 | 48,700 | 407,200 | 1,872,100 |
| Total | 84 | 9,305,860 | 29,259 | 6,516,052 | 189,648,666 | 35,693,300 | 131,967,800 |
| Other "lode" material: | | | | | | | |
| Dry gold: | | | | | | | |
| Mill cleanings | 1 | 6 | 82 | 33 | | | |
| Old tailings | 1 | 6,300 | 91 | 2 | | | |
| Copper: Precipitates | 1 | | | | 3,170,017 | | |
| Zinc: | | | | | | | |
| Old tailings | 1 | 364 | 4 | 1,661 | 700 | 9,500 | 42,900 |
| Old slag | 2 | 43,900 | | 183 | 500 | 910,100 | 8,754,400 |
| Total | 6 | 50,570 | 177 | 1,879 | 3,171,217 | 919,600 | 8,797,300 |
| Total "lode" material | 152 | 9,535,789 | 36,625 | 7,385,836 | 192,852,000 | 37,284,000 | 141,040,000 |
| Gravel (placer operation) | 7 | (2) | 1,496 | 72 | | | |
| Total, lode and placer | 159 | | 38,121 | 7,385,908 | 192,852,000 | 37,284,000 | 141,040,000 |

[1] Detail will not necessarily add to total, because some mines produce more than 1 class of material.
[2] 267,387 cubic yards.

Increased supplies of copper in 1956 resulted in price reductions from 46 to 36 cents per pound by the major copper producers. Simultaneously with the last price drop of the year, The Anaconda Co. announced a 16-percent curtailment in production, effective October 29. The cutback was accomplished by eliminating overtime and holiday work.

Digitized by Google

**TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by types of material processed and methods of recovery, in terms of recoverable metals**

| Type of material processed and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Amalgamation | 1,047 | 137 | | | |
| Concentration, and smelting of concentrates: Ore | 28,699 | 6,445,968 | 189,509,367 | 33,090,800 | 131,622,000 |
| Total | 29,746 | 6,446,105 | 189,509,367 | 33,090,800 | 131,622,000 |
| Direct smelting: | | | | | |
| Ore | 6,793 | 937,854 | 171,416 | 3,273,600 | 620,700 |
| Mill cleanings | 82 | 33 | | | |
| Old tailings | 4 | 1,661 | 700 | 9,500 | 42,900 |
| Old slag | | 183 | 500 | 910,100 | 8,754,400 |
| Copper precipitates | | | 3,170,017 | | |
| Total | 6,879 | 939,731 | 3,342,633 | 4,193,200 | 9,418,000 |
| Placer | 1,496 | 72 | | | |
| Grand total | 38,121 | 7,385,908 | 192,852,000 | 37,284,000 | 141,040,000 |

The long-term outlook for copper mining in the State continued to improve in 1956. The Anaconda Co. inaugurated a $36 million long-range development and expansion program. Projects already underway were the Berkeley pit and the Northwest project. Future developments planned included: (1) East project, an underground operation in the alluvial-covered valley between Butte Hill and the Continental Divide, and (2) Continental project, a second big open pit still farther east toward the Continental Divide that would be developed if metallurgical tests indicated that the ore could be treated with satisfactory recovery of copper.

The year was marked by the first substantial production of ore by open-pit mining at Butte. Shipments of ore from the new Berkeley pit increased from 3,000 tons per day in January to nearly 10,000 tons at the end of 1956. The ore was crushed first at the pit site. Waste was hauled by truck to an area north of the pit. Advance stripping of waste was slightly ahead of schedule. It was planned to install a system of belt conveyors to transport crushed ore to a nearby spur of the Butte, Anaconda & Pacific Railway for shipment to the Anaconda Reduction Works. Ore bins and shops were under construction at the pit site. Information on the project, as well as on other mining and metallurgical developments of the company, was contained in the Anaconda annual report for 1956. A full-scale operation at the Berkeley project was to be attained by mid 1957, at which time production was to be 17,500 tons of ore per day. Annual yield of copper was expected to be 65 million pounds.

The first work on the Northwest project was begun during 1956. Two new shafts—Ryan and Missoula—were to be sunk. These shafts were to provide expanded hoisting facilities to handle high-grade copper and zinc ores from the lower levels of mines in the northwest portion of the Butte district and provide means to develop large known reserves of lower grade copper and zinc-bearing deposits in outlying areas not readily available from existing shafts. Sinking of the Ryan shaft and construction of a spur line of the Butte, Anaconda & Pacific Railway were to be begun in 1957. The Missoula shaft

Digitized by Google

was planned as an auxiliary hoisting and service shaft to permit development in the northwestern part of the district. A shaft raised 182 feet from the Alice-Lexington tunnel was equipped with hoist. Actual sinking of the Missoula shaft below the tunnel level was to begin in 1957.

Also in connection with the Northwest project, haulage crosscuts were started from the 2,100 level of the Anselmo mine and the 3,400 level of the Mountain Con mine. First production through the Ryan shaft was scheduled for late 1959. Further development was to increase ore hoisting through the shaft to 7,500 tons of ore per day by 1961, and capacity later could be expanded to 15,000 tons per day.

Production from the Kelley mine (Greater Butte block-caving project) was approximately 15,000 tons of ore per day from the 600 and 1,300 levels. Haulage crosscuts on the 1,600 and 2,000 levels were being driven. Production from the Butte high-grade copper mines continued at the same rate as in 1955.

At the Anaconda Reduction Works improvement and expansion were continued to process the increased copper-ore output from Butte. The first of 3 new large grinding units, as well as an improved and expanded flotation system, was placed in operation at the copper mill, and the remaining 2 sections were to be installed in 1957. Milling capacity was to be increased from 28,000 to 43,000 tons per day through installation of these units. No addition in smelter capacity was to be required, because the improved flotation methods produced concentrate of higher grade. Infrared thawing units were installed at the East Anaconda tipple to improve ore dumping in freezing weather. At the Great Falls plant a 3-year program of remodeling and enlargement was begun to increase copper-refining capacity by one-third.

**Gold.**—For the second consecutive year, gold production increased significantly. Total putput of the precious metal rose 36 percent above the previous year, despite a decline in placer gold. The major gain in lode output was due largely to expanded operations at the Butte Hill mines of The Anaconda Co. A substantial shipment from the White Development Co. Golden Sunlight mine (Jefferson County) contributed to the increase. The last reported production from this mine was in 1950. Over three-quarters of the State total was derived from Silver Bow County.

Development was reported at several gold mines. Little Rockies Mining & Development Co. completed a 50-ton flotation plant at its property in the Little Rockies mining district (Phillips County). In the same area, Northern Mining & Milling Co. built a 75-ton flotation mill at the Hawkeye open-pit property and did considerable bulldozing. Basin Jib Mines, Ltd., completed shaft sinking at the Basin Jib mine in Jefferson County; previously the firm operated the mine by open-pit methods. Production was reported by Montana Mining & Milling Co. from its newly acquired Empire mine (Lewis and Clark County near Marysville), and in Lincoln County activity was reported at the Morning Glory mine after reorganization of the old Morning Glory Mining Co.

Gold recovered at placer mines totaled 1,496 ounces compared with 3,352 ounces in 1955. Production was reported from only seven mines. E. T. Vincent & Clay Lewis operated a dragline dredge in



Digitized by Google

**TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals**

| County and district | Mines producing | | Material sold or treated (short tons) | Gold (lode and placer) (fine ounces) | Silver (lode and placer) (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) | Total value |
|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | | | | | | | |
| Beaverhead County: | | | | | | | | | |
| Argenta | 5 | | 4,331 | 463 | 13,541 | 20,600 | 1,053,200 | 131,400 | $220,569 |
| Bryant | 1 | | 70 | 1 | 1,836 | 8,400 | 9,100 | 7,600 | 7,737 |
| Blue Wing, Medicine Lodge, and Polaris (Lost Cloud) [1] | 4 | | 157 | 4 | 9,615 | 1,000 | 17,700 | 5,000 | 12,731 |
| Broadwater County: | | | | | | | | | |
| Backer and Beaver [1] | 7 | 1 | 181 | 150 | 595 | | 17,500 | 5,300 | 9,262 |
| Cedar Plains | 4 | | 333 | 34 | 824 | 1,400 | 17,700 | 41,200 | 10,954 |
| Park or Indian Creek | 6 | | 805 | 844 | 2,624 | 600 | 22,800 | 15,500 | 37,873 |
| Cascade County: Barker and Montana [1] | 4 | | 709 | | 26,815 | | 48,000 | 50,000 | 38,655 |
| Granite County: | | | | | | | | | |
| Boulder and South Boulder, Dunkleburg, and Red Lion [1] | 3 | | 209 | 40 | 134 | 2,000 | 2,900 | | 2,827 |
| Flint Creek | 3 | | 36,347 | 438 | 413,246 | 64,000 | 1,105,100 | 4,092,000 | 1,150,643 |
| Jefferson County: | | | | | | | | | |
| Basin, Bigfoot and State Creek, Boulder, and Warm Springs Creek [1] | 5 | | 5,163 | 1,112 | 6,014 | 17,200 | 44,100 | 6,600 | 59,500 |
| Cataract | 7 | | 597 | 156 | 4,677 | 13,000 | 20,700 | 38,300 | 23,715 |
| Clancy and Lump Gulch | 6 | | 1,989 | 62 | 11,620 | 1,800 | 61,000 | 39,300 | 28,413 |
| Colorado | 6 | | 14,243 | 510 | 59,862 | 12,800 | 557,700 | 146,500 | 185,098 |
| Elkhorn | 1 | | 440 | 97 | 3,854 | 600 | 44,100 | 20,900 | 16,925 |
| Whitehall | 5 | | 7,926 | 887 | 630 | 600 | 20,400 | 2,400 | 35,402 |
| Lewis and Clark County: | | | | | | | | | |
| Bear Gulch | 1 | | 9 | 2 | 148 | | 2,400 | 100 | 595 |
| Canyon Ferry | 1 | | 2,457 | | 1,611 | 2,000 | 385,900 | 25,600 | 66,401 |
| Canyon Creek, Heddleston, and Lincoln [1] | 4 | | 2,364 | 62 | 19,116 | 71,000 | 322,300 | 63,300 | 108,919 |
| Marysville | 3 | | 233 | 31 | 972 | | 1,000 | 5,000 | 2,807 |
| Rimini, Scratch Gravel, and York [1] | 4 | | 516 | 83 | 759 | 1,000 | 7,900 | 5,100 | 5,956 |
| Smelter | 1 | | 43,809 | | | | 906,500 | 8,722,900 | 1,337,358 |
| Madison County: | | | | | | | | | |
| Alder Gulch, Rabbit, Rochester, and Sheridan [1] | 7 | | 203 | 84 | 610 | | 13,600 | 1,800 | 5,873 |
| McCarthy Mountain | 1 | | 11 | 1 | 3 | | 200 | | 69 |
| Pony and South Boulder | 1 | | 14 | 15 | 13 | | | | 537 |
| Silver Star, Tidal Wave (Twin Bridges), and Washington [1] | 5 | | 32 | 14 | 116 | | 200 | 200 | 655 |
| Mineral County: | | | | | | | | | |
| Cedar Creek and Cedar and Trout Creek [1] | 2 | 3 | 6,306 | 1,091 | 19 | | | | 38,202 |
| Iron Mountain and Saltese [1] | 3 | | 152 | 1 | 737 | 2,000 | 12,000 | 2,000 | 3,710 |
| Missoula County: | | | | | | | | | |
| Caloma | 1 | | 17 | | 1 | 1,600 | | | 681 |
| Nine Mile | 1 | | 6 | 54 | 1 | | | | 1,891 |
| Clinton, Copper Cliff, and Wallace [1] | 3 | | 67 | 8 | 618 | 400 | 10,000 | | 2,579 |

Digitized by Google

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Powell County: | | | | | | | | | |
| Big Blackfoot | 1 | | 12 | 15 | 2 | | | | 527 |
| Elliston and Pioneer [1] | 4 | 2 | 7 | 354 | 69 | | 400 | | 12,516 |
| Nigger Hill | 5 | | 334 | 9 | 469 | | 9,600 | 4,000 | 2,794 |
| Sanders County: | | | | | | | | | |
| Eagle | 1 | | 7,620 | 25 | 12,344 | 31,600 | 2,414,300 | 796,400 | 513,629 |
| Prospect Creek (Burns) | 1 | | 1,009 | 1 | 1,773 | 400 | 101,700 | 41,600 | 23,476 |
| Silver Bow County: Summit Valley | 21 | | 9,394,981 | 31,132 | 6,772,380 | 192,584,000 | 29,978,000 | 126,750,000 | 111,138,462 |
| Undistributed [2] | 14 | 1 | 2,130 | 341 | 18,260 | 14,000 | 76,000 | 20,000 | 49,082 |
| Total Montana | 152 | 7 | 9,535,789 | [3] 38,121 | [4] 7,385,908 | 192,852,000 | 37,284,000 | 141,040,000 | 115,157,023 |

[1] Combined to avoid disclosing company confidential data.

[2] Includes values and quantities that cannot be shown separately for Warm Springs district, Fergus County; Hog Heaven district, Flathead County; Barker and Yoge districts, Judith Basin County; Libby district, Lincoln County; Castle Mountain district, Meagher County; New World district, Park County; Little Rockies district, Phillips County; Mineral Point and Overwich districts, Ravalli County; and Independence district, Sweet Grass County.

[3] Source of gold: 36,625 ounces from lode mines; 1,496 ounces from placers.

[4] Source of silver: 7,385,836 ounces from lode mines; 72 ounces from placers.

Digitized by Google

Cedar and Trout Creek district (Mineral County). Another principal producer was Montana Gold & Chemical Co. This firm operated the Reservoir placer, 4 miles south of Gold Creek (Powell County), during September, October, and part of November. A Yuba bucketline dredge, a bulldozer, and 8 hydraulic giants made up the equipment; 340 ounces of gold was recovered.

**Iron Ore.**—Ralls & Harris Bros. continued to operate the Iron Cross open-pit mine 3 miles north of Radersburg (Broadwater County), with production from an outcrop of magnetic iron ore; all output was shipped to a cement plant for use in manufacturing special cements. Discovery of a huge deposit of iron ore in the Dillon area (Beaverhead County) by Minerals Engineering Co. was reported. Drilling of the ore body, which was found on Carter Creek 12 miles southeast of Dillon, indicated 42 million tons of ore in a deposit 12,000 feet long and 900 feet wide. According to company officials, metallurgical tests showed that Premium-grade iron concentrate, containing 60 to 65 percent iron with less than 5 percent silica, could be recovered from the ore. At the end of the year plans for developing the deposit had not been announced. In the Little Belt Mountains southeast of Stanford (Judith Basin County) mining to recover Direct-Shipping-grade ore was initiated by the Young-Montana Corp., a newly organized concern. Operations were by open-pit methods.

**Lead.**—Production of lead continued to increase from the low point of 1954 and gained 9 percent compared with 1955. As in previous years, The Anaconda Co. in Silver Bow County supplied most of the output (80 percent). Production totaled 14,989 tons in Silver Bow County compared with 14,331 tons in 1955, while the remaining counties produced 3,653 tons as against only 2,697 tons in 1955. The number of mines producing lead and lead-zinc ores increased only slightly—from 56 to 62; however, all of the larger operations reported a greater output of lead than in the previous year. In addition to the Butte operations, 2 mines in the State produced over 500 tons of recoverable metal—the Maulden mine operated by Ida B. Hand (Beaverhead County) and the Jack Waite mine of American Smelting and Refining Co. (Sanders County).

Settlement in February of a strike that idled the Jack Waite operation during the latter half of 1955 explained the substantial increase from this property. Increases were also made at the Trout-Algonquin and Scratch All mines (Granite County); the Alta mine (Jefferson County); and the Nick & Dick and Mike Horse mines (Lewis and Clark County). A slight gain in recovery of lead from old slag was recorded at The Anaconda Co. fuming plant (Lewis and Clark County). Small shipments of crude ore were made from the Snowshoe and St. Paul mines (Lincoln County) as the result of development projects begun during the year. American Smelting and Refining Co. operated the East Helena lead smelter throughout 1956.

**Manganese.**—The principal markets for the manganese produced in Montana were steel plants, dry-cell-battery and chemical manufacturers, and Government stockpiles. The Butte manganese mines continued to supply the bulk of the output. The Butte ore (from the Emma and Niagara mines) was concentrated, sintered, and nodulized and used mainly at the Anaconda and Great Falls metallurgical plants in making ferromanganese for the steel industry; smaller tonnages of

Digitized by Google

nodules were consigned to eastern manufacturing centers. Trout Mining Division, American Machine & Metals, Inc., continued to produce Battery-grade manganese concentrate at the Trout-Algonquin property near Philipsburg. The firm also shipped lower grade material to a consumer. Also near Philipsburg the Taylor-Knapp Co. operated the Moorlight mine and shipped beneficiated material, analyzing 42 to 45 percent manganese, to the Government high-grade stockpile under the carlot program.

Shipments to the low-grade stockpiles at Butte and Philipsburg are not included in State mineral-production totals until the ore is removed from the stockpiles and beneficiated for commercial use. In all 69,952 short dry tons of ore and concentrate valued at $1,869,231 was shipped to these stockpiles compared with 60,197 short dry tons valued at $1,257,023 in 1955. Larger shippers to the low-grade stockpiles included: Granite County—Peter Antonioli, Scratch All mine; Taylor-Knapp Co., Moorlight (True Fissure) mine; and Trout Mining Division, Trout-Algonquin mine. Missoula County—Pioneer Corp., Arrowhead mine. Silver Bow County—Lloyd Brynie, Nettie-Hubernic mine; Butte Mines Merger Corp., Minnie Jane mine; Irving & Nelson, Norwich-Plutus-Little Sara mine; and Peter Antonioli, Tzarena mine.

An article describing the mineralogy of the manganese vein deposits of the Butte mining district, the oxidation and the enrichment processes, and the use of this information in prospecting was published.[4] Information was derived from a study of the Emma, Star West, Tzarena, and Norwich mines, selected as representative of the district.

**Silver.**—Expanded production from Butte mines upped Montana silver production for the second consecutive year. Total output was nearly 7.4 million fine ounces, a 21-percent gain over 1955. By-product silver from the Butte operations accounted for virtually all of Silver Bow County production, as well as 91 percent of the State total. The largest of the other mines supplementing the total were the Trout-Algonquin and Scratch All (Granite County). These operations also yielded manganese, lead, and zinc.

Substantial quantities of silver were recovered from the Alta mine (silver ore) (Jefferson County); Boss mine (silver ore) (Cascade County); and Moorlight mine (manganese-zinc ore) (Granite County).

**Tungsten.**—The Ivanhoe mine of Minerals Engineering Co. near Glen in Beaverhead County continued to supply the bulk of the State output. Mine production remained high, despite uncertainty as to whether the Government tungsten-purchase program would be continued. Operations at the Ivanhoe mine were suspended for a short period in the spring but were resumed after passage by the United States Congress of a bill authorizing additional purchases of tungsten. As in previous years, high-grade concentrate from the company mill was shipped to GSA, and low-grade concentrate was shipped to the Salt Lake Tungsten Co. in Salt Lake City, Utah, for conversion to a high-grade synthetic scheelite product. The company also began operations at the new Red Button property northwest of Glen. Indications were that the property could be developed into a substantial producer.

[4] Allsman, T. L., Oxidation and Enrichment of the Manganese Deposits of Butte, Mont.: Min. Eng., vol. 8, No. 11, November 1956, pp. 1110-1112.

Digitized by Google

**Uranium.**—Uranium prospecting and development were centered in Mineral and Ravalli Counties in western Montana and in Carbon and Jefferson Counties in the central part of the State. Plans for an exploration program of a new discovery known as the Lucky Joe claims south of Darby (Ravalli County) were reported late in the year. A prospect east of Saltese in Mineral County also was to be developed. Activity was reported in the Pryor Mountains 45 miles south of Billings where ore of commercial grade was discovered on the Old Glory claim in 1955. No large shipments of uranium ore from Montana operations were reported in the year.

An information circular giving general information on uranium prospecting in Montana was published.[4] The circular was designed to serve as a prospectors' guide to sources of information on uranium occurrences in the State.

**Zinc.**—Zinc production increased again in 1956 but still was substantially below 1951–53. Output of 70,520 tons represented a 3-percent gain over 1955. As in previous years, The Anaconda Co. operations supplied nearly all of the metal produced in the State (97 percent). Of the total, Silver Bow County supplied 90 percent, the bulk of the ore coming from the Anselmo, Lexington, and Orphan Girl lead-zinc mines and the Emma manganese mine, all at Butte. Project ores from the Elm Orlu development and Syndicate pit yielded small quantities of zinc. In other areas the East Helena fuming plant (Lewis and Clark County), which treated old zinc slag, and the Trout-Algonquin mine (lead-zinc-manganese ore) and Scratch All mine (zinc-manganese ore) (Granite County) produced more than 500 tons of recoverable zinc. Milling capacity at the Trout-Algonquin mine was expanded to 150 tons of ore in 1956. Other zinc producers included the Moorlight mine (zinc ore and manganese tailing) (Granite County) and the Jack Waite mine (lead-zinc ore) (Sanders County).

**Miscellaneous Metals.**—Minor metals contained in base-metal ores processed in Montana included arsenic, bismuth, cadmium, indium, palladium, and platinum. Production of cadmium totaled 1,956,315 pounds compared with 1,552,004 pounds in 1955, according to The Anaconda Co. annual report.

## NONMETALS

**Barite.**—Baroid Sales Division, National Lead Co. acquired the mine and grinding plant of the Finlen & Sheridan Mining Co. near Greenough, Missoula County, on June 1. This continued to be the only barite producer in the State. Output, which was above that of 1955, was marketed in crushed form to sugar refineries and as a ground product for use in rotary-drilling mud.

**Cement.**—Production of cement continued to advance for the third consecutive year. Increases in output and value were 8 and 15 percent, respectively. The Montana Division, Ideal Cement Co., Trident plant in Gallatin County was the only producer in the State. The plant continued to use limestone from the Trident quarry and gypsum from the company quarry in Fergus County. Small quantities of silica rock and iron ore, also for use at the plant, were purchased. Plans revealed by the company for a general expansion program included construction of a new plant adjacent to the Trident facility.

[4] Sahinen, Uuno M., Prospecting for Uranium in Montana: Montana Bureau of Mines and Geol., Inf. Circ. 6, 2d ed., May 1956, 13 pp.

Digitized by Google

**Clays.**—The combined production of fire clay and miscellaneous clay declined 4 percent compared with 1955; in contrast, the value advanced in about the same proportion. The principal plants using miscellaneous clay for manufacturing heavy clay products included: Lewistown Brick & Tile Co. (Fergus County), Lovell Clay Products Co. (Yellowstone County), and Western Clay Manufacturing Co. (Powell County). These products also were made in Cascade and Hill Counties. The Anaconda Co. metallurgical plant at Anaconda was furnished fire clay from the underground Armington mine in Cascade County.

Mining of bentonite at the Alzada pit (Carter County) by Baroid Sales Division, National Lead Co., was curtailed. The product was marketed mainly for use in rotary-drilling mud and as a bonding agent in manufacturing refractories.

**Fluorspar.**—The Cummings-Roberts Crystal Mountain mine near Darby, Ravalli County, yielded over twice the total mined in 1955. This accelerated activity resulted mainly from shipments to the GSA stockpile and also from substantial increases in consumption at steel plants and other metallurgical installations.

Development mining was begun in October by Finlen & Sheridan Mining Co. at a newly discovered fluorspar deposit at the headwaters of Fish Creek in southern Mineral County near the Idaho–Montana border. Output in 1957 was to be shipped to the GSA stockpile.

The Government (GSA) purchase program for Acid-grade fluorspar authorized acquisition by December 31, 1958, of 250,000 tons of newly mined material containing not less than 97 percent $CaF_2$ at $53 per short dry ton, f. o. b. mine.

**Gem Stones.**—Accurate and detailed information relative to the production of gem stones in Montana cannot be obtained readily because of the nature of the industry. There was no large-scale mining; the bulk of the material was collected by hobbyists and a few commercial dealers. Montana moss agate, the gem material for which the State is famous, was being depleted and becoming more difficult to find, according to many reports. The value of crude gem stones collected each year has been estimated at about $35,000.

According to an article,[6] Thomas P. Sidwell (Billings, Mont.) and Commercial Uranium Mines (Denver, Colo.), jointly purchased the controlling interest in the New Mine Sapphire Syndicate, a British firm that owned the Yogo sapphire deposit in Judith Basin County. The deposit was worked during 1890–1927 but has been inactive since. The new owners planned immediate production.

**Gypsum.**—The combined output from the Shoemaker mine (United States Gypsum Co.), and Hanover mine (Ideal Cement Co.), was about 20 percent less than in 1955. These operations, both in Fergus County, were the only sources of gypsum in the State. Only once in the preceding 10 years had production been so low. This decline reflected in part the general slow-down in dwelling construction during 1956.

**Lime.**—A 35-percent increase in lime production was reported compared with 1955. At its plant 18 miles west of Helena, the Elliston Lime Co. (Powell County) continued to burn limestone to quicklime, most of which was marketed as hydrated lime. It was used at metal-

[6] Mining World, vol. 18, No. 10, September 1956, pp. 131–132.

Digitized by Google

lurgical plants, ore concentrators, chemical works, petroleum refineries, and water purification and softening installations. Limestone was calcined by The Anaconda Co. for use at various plant operations at Anaconda, Deer Lodge County. Demand at the plants was reflected in increased production at the kilns.

**Mica.**—Development by Daniel T. Barham at the Thumper Lode No. 1 resulted in shipment of two small lots of hand-cobbed mica to the GSA Custer (S. Dak.) Purchase Depot. This pegmatite deposit, about 20 miles southeast of Bozeman, Gallatin County, was being developed under a DMEA assistance loan.

**Phosphate Rock.**—Output of marketable phosphate rock increased for the sixth consecutive year. The 1956 total more than double that in 1950. Montana Phosphate Products Co. (Garrison, Powell County) operated its Anderson underground and strip mines throughout the year at an advanced pace. In contrast, production from the company Graveley mine declined considerably, and the operation was closed permanently during the latter part of the year. The Luke and Gimlet mines were inactive. The company shipped phosphate rock to chemical-fertilizer plants at Trail and Kimberley, British Columbia. Also in Powell County, the George Relyea mine continued active.

Victor Chemical Works also contributed substantially to the State total. Rock from the Canyon Creek mine (Beaverhead County) and Maiden Rock mine (Silver Bow County) was processed at the company elemental phosphorus plant at Silver Bow.

Initial production was reported by the J. R. Simplot Co. from its Centennial Mountain open-pit operation near Lakeview, Beaverhead County, early in August. Ore, trucked to the railhead about 40 miles from the mine, was crushed before it was loaded for shipment to chemical-fertilizer plants in British Columbia.

Triple superphosphate and phosphoric acid production was reported by The Anaconda Co. from its plant at Anaconda. Rock processed in the plant was shipped from a company-operated mine at Conda, Idaho. Increased demand for ammonium phosphate fertilizers caused the company to begin construction of a new plant to make this product.

A Bureau of Mines publication [7] detailed progress in research leading toward adaptation of planing machines, such as had been developed for use in coal mines, to the mining of underground seams of phosphate rock.

**Pumice.**—A small quantity of volcanic cinder was produced by Baker Cement Products Co. from a deposit near Baker, Fallon County. This material was used as an aggregate for making cement blocks.

**Pyrite.**—The output of pyrite concentrate declined almost 25 percent compared with 1955. This product was recovered by The Anaconda Co. from mill tailings resulting from processing Silver Bow County base-metal ores. At Anaconda the company produced sulfuric acid for use at its chemical-fertilizer plant and metallurgical works from this concentrate.

**Sand and Gravel.**—The output of sand and gravel—a little over 10 million tons—was about 27 percent less than in 1955. In contrast, the value of this production ($7.2 million) advanced 8 percent. Distribution between commercial and Government-and-contractor was

[7] Howard, T. E., Design and Development of a Pneumatic Vibrating-Blade Planer for Mining Phosphate Rock: Bureau of Mines Rept. of Investigations 5219, 1956, 29 pp.

Digitized by Google

3.0 million tons ($3.2 million) and 7.0 million tons ($4.0 million), respectively. The quantity of commercial sand and gravel recorded in 1956 was almost 1 million tons greater than 1955, while output in the Government-and-contractor category declined 4.7 million tons. Operations in 34 of the State's 56 counties contributed to the output.

It was expected that the falloff in demand for sand and gravel which resulted from completion of construction at the Bureau of Reclamation Tiber Dam project in Liberty County would be offset by initiation of construction at the Noxon Rapids Dam (Sanders County) and at two airbases, as well as by expansion of State highway-department

**TABLE 13.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | | Percent of change in— | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Average | Short tons | Value | Average | Tonnage | Average value |
| COMMERCIAL OPERATIONS | | | | | | | | |
| Sand: | | | | | | | | |
| Building | 210,112 | $345,563 | $1.64 | 344,923 | $577,392 | $1.67 | +64 | +2 |
| Road material | 51,746 | 59,548 | 1.15 | 116,105 | 131,596 | 1.13 | +124 | −2 |
| Other | 165,321 | 95,334 | 1.58 | 30,576 | 7,730 | .25 | −82 | −57 |
| Total sand | 427,179 | 500,445 | 1.17 | 491,604 | 716,718 | 1.46 | +15 | +25 |
| Gravel: | | | | | | | | |
| Building | 393,072 | 563,394 | 1.43 | 597,291 | 720,493 | 1.21 | +52 | −15 |
| Road material | 489,674 | 421,730 | .86 | 1,019,952 | 1,065,104 | 1.04 | +108 | +21 |
| Railroad ballast | 390,608 | 286,463 | .73 | 598,032 | 523,895 | .88 | +53 | +21 |
| Other | 307,003 | 142,608 | .46 | 263,318 | 136,548 | .52 | −14 | +13 |
| Total gravel | 1,580,357 | 1,414,195 | .89 | 2,478,593 | 2,446,040 | .99 | +57 | +11 |
| Total sand and gravel | 2,007,536 | 1,914,640 | .95 | 2,970,197 | 3,162,758 | 1.06 | +48 | +12 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | | | |
| Sand: | | | | | | | | |
| Building | 113,209 | 47,932 | .42 | 328,925 | 134,732 | .41 | +191 | −2 |
| Road material | 6,763 | 1,030 | .15 | 12,825 | 1,900 | .15 | +90 | 0 |
| Total sand | 119,972 | 48,962 | .41 | 341,750 | 136,632 | .40 | +185 | −2 |
| Gravel: | | | | | | | | |
| Building | 5,204,433 | 1,747,833 | .34 | 18,660 | 46,143 | 2.47 | −99 | +626 |
| Road material | 6,439,668 | 2,903,891 | .45 | 6,693,763 | 3,828,277 | .57 | +4 | +27 |
| Total gravel | 11,644,101 | 4,651,724 | .40 | 6,712,423 | 3,874,420 | .58 | −42 | +45 |
| Total sand and gravel | 11,764,073 | 4,700,686 | .40 | 7,054,173 | 4,011,052 | .57 | −40 | +43 |
| TOTAL ALL OPETATIONS | | | | | | | | |
| Sand: | | | | | | | | |
| Building | 323,321 | 393,495 | 1.22 | 673,848 | 712,124 | 1.06 | +108 | −13 |
| Road material | 58,509 | 60,578 | 1.04 | 128,930 | 133,496 | 1.04 | +120 | 0 |
| Other | 165,321 | 95,334 | .58 | 30,576 | 7,730 | .25 | −82 | −57 |
| Total sand | 547,151 | 549,407 | 1.00 | 833,354 | 853,350 | 1.03 | +52 | +3 |
| Gravel: | | | | | | | | |
| Building | 5,597,505 | 2,311,227 | .41 | 615,951 | 766,636 | 1.24 | −89 | +202 |
| Road material | 6,929,342 | 3,325,621 | .48 | 7,713,715 | 4,893,381 | .63 | +11 | +31 |
| Railroad ballast | 390,608 | 286,463 | .73 | 598,032 | 523,895 | .88 | +53 | +21 |
| Other | 307,003 | 142,608 | .46 | 263,318 | 136,548 | .52 | −14 | +13 |
| Total gravel | 13,224,458 | 6,065,919 | .46 | 9,191,016 | 6,320,460 | .69 | −30 | +50 |
| Total all sand and gravel | 13,771,609 | 6,615,326 | .48 | 10,024,370 | 7,173,810 | .72 | −27 | +50 |

Digitized by Google

activities. These projects did not develop as rapidly as anticipated. The use of sand for construction and as road material increased 108 and 120 percent, respectively, over 1955. Gravel for construction purposes declined 89 percent compared with advances of 11 and 53 percent for road material and railroad ballast during the same period.

**Stone.**—A minor decrease in the output of stone (2 percent) during 1956 was accompanied by a 51-percent advance in value brought about by higher reported unit values for the various rock products. Firms in 15 of the 56 counties in Montana contributed to the total yield of 1.2 million tons valued at $1.8 million. New construction was begun at the Washington Water Power Co. Noxon Rapids Dam and at airbases at Glasgow and Great Falls helped to offset the effect of completion of the Tiber Dam project upon consumption of crushed stone.

Mining operations were active in the following categories, arranged in order of tonnage produced: Limestone (14), sandstone (7), granite (8), and basalt (3). Output of limestone again increased, continuing the upward trend begun in 1953. The major limestone producers were Ideal Cement Co. Trident quarry, Gallatin County; The Anaconda Co. Brown's quarry, Deer Lodge County; Maronick Limestone Co. McClellan Creek quarry, Jefferson County; Bighorn Limestone Co. Warren quarry, Carbon County; and American Crystal Sugar Co. Spring Gulch quarry, Granite County. Most of the limestone was used at cement and lime plants; the bulk of the remainder went to metallurgical works and sugar refineries. The other rock types found use as road metal (granite), railroad ballast (sandstone and basalt), and riprap (basalt, sandstone, and granite). A small tonnage of dimension granite was quarried in Jefferson County.

Quartzite was mined by Victor Chemical Works at a quarry near Melrose, Beaverhead County, for use at its elemental phosphorus plant at Silver Bow.

**Sulfur.**—Construction of a plant for recovering elemental sulfur from hydrogen sulfide gas was completed in June by Montana Sulphur & Chemical Co. at Billings, Yellowstone County. Residual gases from two oil refineries in the vicinity were processed in the plant. This represented the only byproduct sulfur operation in the State.

**Talc.**—Substantial individual gains in output by the 3 producing companies resulted in a total increase of 29 percent compared with 1955. Tri-State Minerals Co. continued to operate the Keystone, Treasure State, and Smith-Dillon-Crown mines in the Beaverhead-Madison County area near Dillon. During the year the company began processing talc at its newly constructed grinding plant near Barratts. Previously, all of the company output was shipped to Ogden, Utah, for grinding.

The Yellowstone mine of Sierra Talc & Clay Co. near Norris, Madison County, was active, and the company operated the Beaverhead mine near Dillon, which it acquired in September 1955. Talc from both mines was shipped for grinding to a company-owned plant at Grand Island, Nebr. The open-pit mine of Nonmetallics, Inc., near Alder, Madison County, was purchased in April by the American Chemet Corp. of East Helena. As in the past, grinding was done at the East Helena plant.

Digitized by Google

Distribution by uses were: Ceramics, 55 percent; paint, 36 percent; and miscellaneous (paper, textiles, and rice polishing), 9 percent.

**Vermiculite.**—Montana continued to be the principal vermiculite-producing State in the Nation, in spite of a decline of about 10 percent compared with 1955 in the output of the Zonolite Co. from its open-pit mine near Libby, Lincoln County. Some of the mined product was expanded by the company. Robinson Insulation Co. of Great Falls expanded and marketed purchased raw material. The product found use in insulation, as aggregate material in concrete and plaster, for agricultural purposes, and in refractories.

## MINERAL FUELS

**Coal.**—Production of bituminous coal and lignite declined 33 and 15 percent, respectively, compared with 1955, marking the 12th consecutive year of diminishing bituminous-coal output. The 1956 total of 846,134 tons was 83 percent less than the peak production in 1944 (4.8 million tons). About 93 percent of the coal output was recovered from 2 mines in Rosebud County and 10 mines in Musselshell County. Other producing counties in order of production, were Carbon, Sheridan, Custer, Blaine, Richland, Dawson, Cascade, and Hill. All of the lignite output came from Sheridan, Custer, Richland, and Dawson Counties.

Northwestern Improvement Co. Rosebud strip mine, operated by Foley Bros., Inc., continued to be the leading coal producer in Montana. Early in November the underground Klein No. 2 mine of Republic Coal Co., the second largest producer, closed.

Koal Krudes, Inc. (Spokane, Wash.) began constructing a coal-processing plant at Red Lodge, Carbon County, to make char (carbonized coal used by smelters and reduction plants as a source of carbon for metallurgical processes), creosote, and other byproducts from coal. Montana-Dakota Utilities Co. began building an $8 million steam-electric generating plant near Sidney, Richland County, on the west bank of the Yellowstone River. The plant, expected to begin operation in the fall of 1958, will utilize pulverized lignite as fuel.

**Petroleum and Natural Gas.**[6]—Montana's petroleum industry continued to set new production records during 1956, as output of this essential commodity increased 39 percent to 21.8 million barrels ($56.1 million) compared with 15.6 million barrels ($35.4 million) in 1955. Accelerated exploration and development resulted in completion of 493 wells—89 more than last year—and the rate of discovery of crude oil or gas per well drilled improved from 41 percent to 50. New fields included: Bredette-North (4 wells), Roosevelt-Daniels County; Clarks Fork-North (4 wells), Carbon County; Outlook area, Sheridan County; and Repeat (1 well), Carter County. In Dawson County the Sand Creek field was abandoned, with no production reported for the year. Poplar field (Roosevelt County) again was the major producing area in the State, with a total output of almost 4 million barrels. Over 1 million barrels was reported for the following fields: Pine—Fallon, Prairie and Wibaux Counties; Cut Bank—Glacier, Pondera, and Toole Counties; Elk Basin—Carbon County;

[6] Production figures for crude oil and natural gas, by fields, were obtained from the Montana Oil and Gas Statistical Bulletin, a monthly publication of the State Oil and Gas Conservation Commission.

Digitized by Google

Cabin Creek—Fallon County; Sumatra—Rosebud County; and Kevin-Sunburst—Toole County.

According to the Oil and Gas Conservation Commission of the State of Montana, during 1956, 3,640 wells yielded a daily average of 59,615 barrels of crude oil from 59 fields, and over 9.0 million barrels of Montana crude was refined in the State.

Major improvements in the industry included completion of the Butte pipeline from eastern Montana to Wyoming and expansion of capacity at refineries of the Carter Oil Co. and Continental Oil Co. Connections with pipelines to the Midwest provided new markets for Montana crude oil. Plant improvements by both companies resulted in the production of automotive and diesel fuels with lower sulfur content. Residual gases from the refineries were processed by Montana Sulphur & Chemical Co. at Billings to recover elemental sulfur.

Marketed production of natural gas totaled 25.8 billion cubic feet. Almost half of the natural-gas output (13.8 billion cubic feet) came from the Cut Bank field (including Reagan) in Glacier and Toole Counties. Continuing as the leading field, Cut Bank was followed, in order of output, by Cedar Creek, Dry Creek, Bowdoin, Whitlash, and Kevin-Sunburst; each produced over 1 billion cubic feet.

Texas Natural Gas Corp. began constructing a natural-gas-processing plant near Glendive (Dawson County) during the year. The plant was designed to remove propane, butane, and natural gasoline from gas produced in the Cabin Creek and Pine oilfields of eastern Montana.

## REVIEW BY COUNTIES AND DISTRICTS

**Beaverhead.**—Minerals Engineering Co. continued to operate the Ivanhoe mine near Glen and supplied the major share of the State output of tungsten ore. High-grade concentrate produced in the company mill was shipped to GSA, and low-grade concentrate was consigned to the Salt Lake Tungsten Co.—an associated firm in Salt Lake City, Utah, which converted the concentrate to a high-grade artificial scheelite. The company also began operations at the newly acquired Red Button mine in the Wise River area. Production was by open-pit methods. Preliminary drilling of a new iron-ore deposit by Minerals Engineering Co. indicated reserves exceeding 42 million tons. It was believed the iron could be recovered magnetically to produce an iron concentrate of 60- to 65-percent grade and containing less than 5 percent silica. The deposit, in the Sweetwater Hills 12 miles south of Dillon, was 12,000 feet long and 900 feet wide. The full extent of the depth of the deposit had not been determined. Shipments to Government low-grade stockpiles were made from the following manganese mines: Blackstone, Shaffer, and Gob.

Victor Chemical Works continued to operate the Canyon Creek mine near Melrose to produce phosphate rock used at its elemental-phosphorus plant at Silver Bow. Quartzite for fluxing purposes was mined by the company in the same area. Initial production of phosphate rock was reported by J. R. Simplot Co. from the Centennial open-pit mine in the Centennial Mountains near Lakeview. Two talc-mining operations were active. Output of the Smith-Dillon-Crown mine by Tri-State Minerals Co. was ground both at the new

Digitized by Google

**TABLE 14.—Value of mineral production in Montana, 1955–56, by counties[1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Beaverhead | $4,584,855 | $5,424,390 | Tungsten, phosphate rock, lead, talc, stone, silver, zinc, gold, copper. |
| Big Horn | 348,878 | 469,661 | Petroleum, sand and gravel. |
| Blaine | 657,455 | 498,792 | Petroleum, coal, sand and gravel. |
| Broadwater | 138,815 | 147,292 | Iron ore, gold, sand and gravel, lead, zinc, silver, stone, copper. |
| Carbon | 4,260,078 | 5,654,557 | Petroleum, stone, coal, sand and gravel. |
| Carter | (2) | (2) | Clays, petroleum. |
| Cascade | 449,858 | 1,011,508 | Sand and gravel, silver, coal, lead, zinc, clays. |
| Chouteau | (2) | | |
| Custer | 89,272 | 93,695 | Sand and gravel, coal. |
| Daniels and Roosevelt | [3] 6,659,824 | 10,541,491 | Petroleum. |
| Dawson and McCone | [3] 2,235,552 | 3,007,459 | Petroleum, sand and gravel, coal. |
| Deer Lodge | 1,258,872 | 645,498 | Lime, stone, sand and gravel, tungsten, clays. |
| Fallon, Prairie, Wibaux | [3] 3,696,386 | 14,518,923 | Petroleum, sand and gravel, pumice. |
| Fergus | (2) | (2) | Gypsum, clays, gold, lead, zinc, silver. |
| Flathead | 178,395 | 373,071 | Stone, sand and gravel, gold, silver. |
| Gallatin | (2) | (2) | Cement, stone, sand and gravel, mica. |
| Garfield and Petroleum | [3] 446,779 | (2) | Petroleum, sand and gravel. |
| Glacier, Pondera, Teton, and Toole | [3] 12,731,011 | 12,774,203 | Petroleum, sand and gravel. |
| Golden Valley | (2) | (2) | Petroleum. |
| Granite | (2) | 1,656,671 | Zinc, silver, manganese ore, lead, stone, manganiferous ore, copper, gold, tungsten. |
| Hill | (2) | (2) | Sand and gravel, coal, petroleum, clays. |
| Jefferson | (2) | 444,779 | Lead, gold, stone, silver, zinc, copper. |
| Judith Basin | (2) | 38,877 | Sand and gravel, iron ore, lead, silver, copper, zinc, gold. |
| Lake | (2) | (2) | Sand and gravel. |
| Lewis and Clark | 1,477,735 | (2) | Zinc, lead, sand and gravel, copper, silver, gold. |
| Liberty | 2,129,726 | (2) | Petroleum, stone, sand and gravel. |
| Lincoln | (2) | (2) | Vermiculite, silver, sand and gravel, lead, zinc, gold. |
| Madison | (2) | (2) | Talc, gold, lead, tungsten, silver, zinc. |
| Meagher | 10,220 | 44,904 | Sand and gravel, copper, silver. |
| Mineral | (2) | 87,912 | Sand and gravel, gold, lead, copper, silver, zinc. |
| Missoula | 360,474 | 371,299 | Sand and gravel, barite, stone, gold, lead, copper, silver. |
| Musselshell | 2,612,260 | 2,855,828 | Coal, petroleum, stone. |
| Park | (2) | 90,065 | Stone, sand and gravel, silver, lead, zinc, gold. |
| Phillips | (2) | 239,940 | Sand and gravel, silver, gold. |
| Powell | (2) | (2) | Phosphate rock, lime, gold, stone, clays, sand and gravel, lead, zinc, silver. |
| Ravalli | (2) | (2) | Fluorspar, sand and gravel, gold, silver. |
| Richland | 176,596 | 105,978 | Petroleum, coal. |
| Rosebud | 5,160,055 | (2) | Petroleum, coal, sand and gravel. |
| Sanders | (2) | 537,105 | Lead, zinc, copper, silver, gold. |
| Sheridan | (2) | 303,868 | Sand and gravel, coal, petroleum. |
| Silver Bow | 94,137,939 | 118,213,646 | Copper, zinc, silver, manganese, lead, gold, phosphate rock, pyrite, sand and gravel. |
| Stillwater | 3,723,509 | 3,814,883 | Chromite, petroleum. |
| Sweet Grass | | 1,755 | Sand and gravel, lead, silver, gold. |
| Treasure | (2) | 9,000 | Sand and gravel. |
| Valley | 26,000 | | |
| Yellowstone | 393,273 | 1,431,345 | Petroleum, sand and gravel, clays, stone. |
| Undistributed[4] | 19,387,779 | 29,225,592 | |
| Total[5] | 166,993,000 | 213,728,000 | |

[1] The following counties are not listed because no production was reported: Powder River and Wheatland.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Daniels and Roosevelt; Dawson and McCone; Fallon, Prairie, and Wibaux; Garfield and Petroleum; and Glacier, Pondera, Teton, and Toole Counties have been combined because of joint oilfield production.
[4] Includes value of gem stones, natural gas, natural-gas liquids, sand and gravel, and tungsten that cannot be assigned to specific counties and values indicated by footnote 2.
[5] Total has been adjusted to eliminate duplicating the value of stone.

company plant near Barratts and at its Ogden (Utah) facility, while talc from the Beaverhead mine was shipped by Sierra Talc & Clay Co. to its grinding plant at Grand Island, Nebr.

*Argenta District.*—The Maulden mine, owned by John and Ida B. Hand, was the largest metal producer in the district. About 4,013 tons of lead ore containing 398 ounces of gold, 11,570 ounces of silver, 23,500 pounds of copper, 1,033,300 pounds of lead, and 200,000

Digitized by Google

pounds of zinc was shipped. Development totaled 2,000 feet of drifts. Also active were the Ferdinand, Goldsmith, and Governor Tilden lead mines and the Yellow Band gold property, which was acquired by French Creek Mining Co.

*Blue Wing District.*—F. E. Herr operated the Charter Oak lead mine, and a shipment of lead-zinc ore was made by Blue Dot Mining Co. from the New Departure mine.

*Bryant District.*—The only active property was the Hecla lead-zinc mine of the Lively Mining Co. Seventy tons of ore was trucked to Melrose for shipment by rail to a smelter. Shaft sinking totaled 200 feet and drifting 300 feet.

*Medicine Lodge District.*—Some lead-zinc ore was shipped from the SS&R mine.

*Polaris (Lost Cloud) District.*—Berry & James terminated work at the Polaris silver mine on April 2 after operating the mine for 6 months under a lease. A shipment of ore was made early in 1956.

**Big Horn.**—Output of crude oil from the Soap Creek, Ash Creek, and Hardin fields was 81,918 barrels greater than 1955. The total valuation was $460,277. Natural gas recovered from the Hardin field totaled 57.4 million cubic feet. Two companies produced sand and gravel.

**Blaine.**—Production of crude oil from the Bowes field declined in 1956. Natural-gas withdrawals from the same field were 717 million cubic feet. The Milk River Coal Mine Co. (G. S. & L. W. Sargent) was active near Chinook. The United States Army Corps of Engineers contracted for a small quantity of road gravel, and county road crews mined and processed gravel for road use.

**Broadwater.**—Ralls & Harris Bros. shipped iron ore from the Iron Cross mine to a cement plant at Trident, Gallatin County.

Gravel for railroad ballast and limestone for riprap were produced by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

*Backer District.*—The Millerl-Slim Jim mine yielded gold ore in 1956.

*Beaver District.*—Six meta mines were active. January Mines, Inc., operated the January group but shipped only 8 tons of ore containing 41 ounces of gold, 57 ounces of silver, and 800 pounds of lead. Gold ore was shipped from the Lonesome Pine property and the Acme mine. Harold Hogan operated the Silver Saddle-North Star claims from January to October, completed a shaft 50 feet in depth and 250 feet of drifting, and shipped a small tonnage of lead-zinc development ore. Louis Peura shipped 1 car of dump material and repaired an access road at the Stray Horse gold-silver mine. Production of lead ore from the Hyantha property was reported.

*Cedar Plains District.*—The Black Hawk-North Star mines yielded lead-zinc ore, and the Copper Queen mine shipped copper ore. Dump ore was produced from the Keating and Eagle mines.

*Park or Indian Creek District.*—The Marietta gold mine, 16 miles northwest of Townsend, was the most important nonferrous-metal producer in the county. Forminco, Inc., a Pennsylvania corporation, operated the mine under lease from Dance & Anders. Lead ore, gold ore, and silver ore, respectively, were produced at the Endeavor, Diamond Hill, and Ace-in-Hole mines, and lead ore and concentrate were shipped from the Iron Mask mine.

Digitized by Google

**Carbon.**—Pryor Mining Corp. continued development work at its uranium-mining operation in the Pryor Mountains. The work was centered on the Old Glory mining claim. Lisbon Uranium Corp. also was developing a prospect. Ore mineralization in the area was metatyuyamunite, localized in a silicified collapse-breccia zone 5 to 6 miles in length along the east flank of the Pryor anticline.[9] The vanadium content was twice that of the uranium. Following an additional discovery of uranium in the Pryor Mountains in September 1955 by 3 prospectors there was a rush of claim staking, and by early 1956 some 450 location notices had been filed with the Carbon County recorder at Red Lodge. Small tonnages of ore have been shipped from the Pryors by three companies to the AEC Riverton (Wyo.) ore-buying station.

The county ranked third in order of petroleum production by virtue of increased output from the Elk Basin field. Other fields that contributed to the output were Clark's Fork, Dry Creek, Frannie, Devils Basin, and Golden Dome. Substantial quantities of natural gas were recovered in the county, particularly from the Cedar Creek field. Bighorn Limestone Co. reported a slight increase in quantity of limestone mined at the Warren quarry. The rock, after grinding, was used at sugar refineries. Coal was mined at the Brophy Coal Co. Smokeless and Sootless mine and at the Smith Mine Coal Dock, Foster mine. Sand and gravel was prepared by two commercial companies. The Northern Pacific Railway Co. produced gravel for ballast and other purposes.

**Carter.**—The quantity of bentonite mined at the Alzada pit by Baroid Sales Division, National Lead Co., was below that in 1955. Initial output of petroleum in the county was made at a newly drilled well in the Repeat field. Production totaled 31,946 barrels worth $57,503.

**Cascade.**—At The Anaconda Co. Great Falls metallurgical plant construction was begun to remodel and enlarge the copper refinery. The plant processed blister copper in the form of anodes from the smelter at Anaconda (Deer Lodge County). The electrolytic-zinc plant treated concentrate produced at Anaconda, as well as custom concentrate from several Western States and foreign countries. An outdoor electrical substation was completed in July. The Anaconda Wire & Cable Co. operated two facilities adjacent to the metallurgical works. The new aluminum-rod mill supplied requirements of all company plants for aluminum rod. The copper-rod and wire mill produced all shapes of bare wire and rod. Output was shipped to American Brass Co. plants in Connecticut and to Anaconda Wire & Cable Co. plants throughout the United States.

Sand and gravel was produced by the Bureau of Reclamation for use at its Sun River project at Fairfield and by county and municipal road crews, the Great Northern Railway Co., and five commercial companies, to be used for railroad ballast, construction, and road building. Contractors supplied a small quantity of road gravel to the United States Army Corps of Engineers. Coal was mined at the East Belt mine (East Belt Coal Mine) and Surmi mine (William Surmi & Son Coal Co.). Fire clay from the Armington mine was used to

---

[9] Work cited in footnote 5.

Digitized by Google

make firebrick at The Anaconda Co. metallurgical works at Anaconda (Deer Lodge County). The Great Falls Brick Co. made brick and tile from clay mined at the Gianinni pit. Robinson Insulation Co. (Great Falls) expanded vermiculite purchased from the Zonolite Co. (Lincoln County) and marketed it for insulation and aggregate purposes.

*Barker District.*—Lead ore from the Sunshine mine was the only metal production credited to the district.

*Montana District.*—The Boss mine of Boss Mines, Inc., yielded a sizable tonnage of silver ore, and the Silver Belle and Star mines produced small tonnages of lead ore. A lead-zinc exploration project was begun at the Boss mine under the DMEA program.

**Custer.**—Sand and gravel was processed by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co., county road crews, and two commercial operators in Miles City. T. J. Fleming mined lignite at the Storm King mine near Miles City.

**Daniels and Roosevelt.**—These counties were combined because a new oilfield (Bredette-North) extends over the Roosevelt County line into Daniels County. Production of crude from Poplar-East (wholly within the confines of Roosevelt County) totaled 3.9 million barrels ($10 million) and again was the leading field in the State. Four wells in the new Bredette field had a combined output of 51,586 barrels valued at $119,164.

**Dawson and McCone.**—Petroleum output increased, gaining slightly over 1955. Production was reported from fields within the boundaries of both counties; but, because the Richey field extends across the McCone County line into Dawson County, both are considered together. The Glendive, Gas City, and Deer Creek fields contributed to the Dawson County yield. Building sand and gravel was produced by Minot Sand & Gravel Co. and paving gravel by county road crews, all from Dawson County. Contractors furnished the Bureau of Reclamation with structural gravel.

A small quantity of lignite was mined at operations of Jacob Albrecht, Bloomfield, and Clyde Clapp, Jr., and Gordon Peuse, both of Glendive.

**Deer Lodge.**—The Anaconda Reduction Works processed copper, lead-zinc, and manganese ores from the Butte mines; copper precipitates from Butte and Yerington, Nev.; toll zinc concentrate and purchased zinc ore; and phosphate rock from Conda, Idaho. The works also produced blister copper, electrolytic zinc, sulfuric acid, phosphate fertilizers, managnese nodules, ferromanganese, and arsenic. A program to expand copper-ore handling and concentrating facilities was continued. Three new large grinding units were installed in the copper mill. Completion of 2 more sections in 1957, plus addition of cyclone classifiers to several units, was to increase milling capacity from 28,000 to 43,000 tons per day.

New flotation methods were placed in operation and produced concentrate of higher grade. Because of these improvements, no expansion of smelting capacity would be needed to process the increased copper-ore output from Butte.

Electric-furnace equipment to melt copper precipitate from Yerington was on hand and was to be installed in 1957. Construction also was to begin in 1957 on an electric furnace to melt zinc cathodes.

Digitized by Google

A pilot plant was under construction to test, on a production basis, successful experimental results in recovering alumina from low-grade aluminous clays. The test plant was to be housed in existing buildings at the Anaconda Reduction Works. The total cost of construction and installing equipment was to be in excess of $1 million. Clay for the new process was to be obtained from company holdings in the Moscow (Idaho) area. If the process proved to be successful, the experiment could lead to the establishment of a metallurgical plant near Moscow to supply alumina for the Columbia Falls aluminum-reduction works. The aluminum industry in America has depended for its basic raw material largely upon bauxite from foreign sources.

The McCabe, Trigger, and Storm Lake tungsten mines were active part of 1956. Tip Top Mining Co., initiated an exploration project at its Tip Top tungsten mine under a contract with DMEA:

At Anaconda several nonmetal raw materials were processed by The Anaconda Co., mainly for use at its various plants. Included were pyrite, recovered from Silver Bow County base-metal ores, converted to sulfuric acid for use at the phosphate plant; limestone, burned to quicklime for metallurgical applications; phosphate rock from Conda, Idaho, converted to triple superphosphate and phosphoric acid; and clay from Cascade County, for use at the reduction-works refractories plant. Tri City Concrete Products, Inc., produced sand and gravel for building and paving purposes and also a small quantity of engine sand. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. prepared gravel for railroad ballast.

**Fallon, Prairie, and Wibaux.**—These counties were combined because of crude-oil production from the Pine field, which extends into portions of the three counties. The Cabin Creek field in Fallon County ranked fifth in the State with output of 1.7 million barrels. Pennel—1 of 2 fields brought into production during 1955—increased crude-oil recovery compared with the level of that year, and ranked second to Cabin Creek in production of this commodity in Fallon County. Extension of the Pine field from Wibaux County into Prairie and Fallon Counties was accompanied by an advance in crude-oil output compared with 1955. Withdrawals of natural gas from the Cedar Creek field, Fallon County, totaled 4.7 billion cubic feet ranking this field in second position in the State. The Bureau of Reclamation (Prairie County) contracted for production of gravel for road use, and Baker Cement Products Co. (Fallon County) mined a small quantity of pumice for use in making building blocks.

**Fergus.**—All of the gypsum mined in Montana during 1956 came from Fergus County. United States Gypsum Co. operated the Shoemaker mine and processed raw gypsum at the Heath plant. Ground gypsum, wallboard, and lath were marketed. Ideal Cement Co. produced gypsum at the Hanover mine near Trident, mainly for use as a retarder in cement manufacture. Some of the output went for agricultural purposes. Lewistown Brick & Tile Co. continued to make heavy clay products from clay mined at its pit near Lewistown. An expansion plan begun by the company during the year included construction of a tunnel kiln, one of the first in the State. The new kiln and drier were designed to produce face and common brick and building tile at a rate of about 30,000 a day.

465877—58——45

Digitized by Google

*Warm Springs District.*—Production of gold ore and lead-zinc ore, respectively, was credited to the Black Bull mine and the Iron Chancellor mine.

**Flathead.**—The new aluminum plant of the Anaconda Aluminum Co. completed its first full operating year. Initial production at the plant was begun in August 1955, and all pots were in full production by November 1955. The $60 million facility, 2 miles northeast of Columbia Falls, obtained power from the Hungry Horse Dam on the south fork of the Flathead River, 8 miles from the reduction plant. Two hundred and forty pots, housed in 4 potrooms, were in production with rated capacity of 60,000 tons of aluminum annually. The pots were of Soderberg vertical-pin anode type operating on 90,000 to 100,000 amperes. The annual report of the company disclosed production of 123 million pounds of aluminum in 1956. Alumina, the basic raw material, was obtained from Gulf Coast States. The plant was the only aluminum-reduction facility in Montana and was 1 of 7 in operation in the Pacific Northwest.

The United States Forest Service contracted for production of granite for road metal, and the Great Northern Railway Co. crushed quartzite for ballast and rubble. Four commercial operators in Kalispell prepared sand and gravel for building and paving uses.

*Hog Heaven District.*—The O. F. Martin operation in Hog Heaven district yielded a small tonnage of gold-silver ore.

**Gallatin.**—The Ideal Cement Co., Montana Division, plant at Trident continued to be the principal mineral industry in the county as well as the only source of cement in the State. The plant utilized limestone quarried at a nearby site. County road crews used granite for riprap and gravel for highway maintenance. Four commercial concerns, 2 at Bozeman and 1 each at Three Forks and West Yellowstone, produced sand and gravel for construction purposes. Two small lots of hand-cobbed mica were shipped to GSA from a pegmatite deposit 20 miles southeast of Bozeman.

**Garfield and Petroleum.**—Petroleum recovery from the Cat Creek field on the border between Garfield and Petroleum Counties totaled 163,998 barrels valued at $423,115. Output, although only slightly less than 1955, declined for the ninth consecutive year. The Rattlesnake Butte field in Petroleum County yielded almost four times more crude than in 1955. Paving gravel was prepared by an operator at Winnett, Petroleum County.

**Glacier, Pondera, Teton, and Toole.**—The disregard of earth-bound petroleum occurrences for political or geographical boundaries again makes it necessary to consider certain producing counties as a group. Cut Bank—the third ranking crude-oil-producing field in Montana and the principal gasfield (including Reagan)—underlies portions of Glacier, Pondera, and Toole Counties. About 41 percent of the 4-county total output (4.6 million barrels valued at $12.6 million), as well as 13.8 billion cubic feet of natural gas, came from the Cut Bank field. The Pondera field, which includes portions of Pondera and Teton Counties, yielded 680,000 barrels to place third in the county grouping.

The largest production from within the confines of a single county in this grouping came from Toole County. Kevin-Sunburst—the most important field in the county—produced 1 million barrels. Of

Digitized by Google

the major fields mentioned, the Reagan field in Glacier County ranked next in output. Pondera field was the only one that reported increased production over 1955. In Toole County the Berthelote and Border fields had small gains. Decreases from one-half to two-thirds of the 1955 output were reported by 3 small fields, the largest of which yielded less than 2,000 barrels.

The United States Army Corps of Engineers contracted for production of road gravel in Glacier and Toole Counties. Two commercial operators in Teton County and three in Toole County prepared sand and gravel.

**Golden Valley.**—A small quantity of crude petroleum was produced from the Women's Pocket field.

**Granite.**—Shipments to Government low-grade stockpiles were made from the following small manganese mines: Chicago (Earl Bellm), Climax (James R. Hunter), Comanche (James W. Young), Iron Age and Redemption (Iron Age and Redemption Mining Claims), Mountain View (Page & Hartley), and Mystery (Jennie Moore and Phil and L. J. Salois). The Tarlach tungsten mine was active part of 1956.

Limestone was mined at the Spring Gulch quarry of the American Crystal Sugar Co. for use at its Missoula refinery. Contractors quarried granite for use as road metal by the United States Forest Service.

*Boulder and South Boulder District.*—Production of lead ore from the Nonpareil mine was recorded.

*Flint Creek District.*—Trout Mining Division of American Machine & Metals, Inc., expanded processing capacity for lead-zinc ore to 150 tons per day at its lead-zinc-manganese operation near Philipsburg by installing an additional milling unit. Drifting totaled 2,500 feet and diamond drilling 500 feet. The Scratch All (Hasmark) operation of Peter Antonioli supplied a sizable tonnage of zinc-manganese ore, and Taylor-Knapp Co. mined and milled zinc-manganese ore at the Moorlight mine in the same area.

**Hill.**—Sand and gravel was produced by two commercial concerns at Havre. Alfred Laursen mined a small quantity of coal from the Rocky Boy mine. Less than 300 barrels of crude oil was recovered from the Rudyard field (opened in 1955). Heavy clay products were made from locally mined clay by the Havre Brick Co.

**Jefferson.**—A uranium prospect on Rock Creek in the Basin area was developed by Great Shield Uranium Mines, Ltd., of Calgary, Alberta, Canada. One carlot shipment was made near the end of the year after an old tunnel was reopened; however, the shipment proved to be of subcommercial grade, and further work at the old property was to be undertaken in 1957 to find the source of high-grade samples in the mine dump.

Stone was the only nonmetal mined in the county. The Maronick Limestone Co. operated the McClellan Creek quarry to obtain limestone for fluxing purposes. Output was shipped to the East Helena lead smelter of American Smelting and Refining Co., Louis Dumas and Trevillion-Johnson Memorials, both of Whitehall, quarried monumental granite.

*Basin District.*—The Basin Jib mine, operated by Basin Jib Mines, Ltd., was one of the leading producers of gold in the State. A shaft-sinking project, begun in 1955, was completed to a depth of 345 feet,

Digitized by Google

and drifting was done on the 300 level to develop enough ore for an operation of 300 tons per day. A new mill was completed and placed in operation on development ore. A new type of mechanical mucker was used in the shaft-sinking project. This was the initial appearance of the machine in the United States; in its first test the device efficiently handled large, blocky, granite boulders encountered in the shaft muck.

*Boulder District.*—Madden & Naegli developed the Bernice lead mine for open-pit production and installed a small mill at Basin having 10-ton capacity. The Morning gold mine also was active.

*Cataract District.*—Active mines included Aurora (lead-zinc ore), Bluebird (lead ore), Boulder (gold ore), Crescent (lead-zinc ore), Golden Thread (lead-zinc ore), Morning Glory (gold-silver ore), and Silver Hill (gold-silver ore).

*Clancy and Lump Gulch District.*—The Nellie Grant lead mine was active, and Louis Peura shipped silver dump ore from the Little Nell mine from May to July.

*Colorado District.*—The Alta gold-silver mine of Lahey Leasing Co. contributed the largest share of metal production of the district. Louis Peura produced gold-silver ore from the Gregory dump, as well as silver ore from the Midway mine. At the latter property an old adit was reopened for the purpose of development. Also active were the Minah mine (silver ore) and the Silver Claim mine (lead-zinc ore).

*Elkhorn District.*—New Elkhorn Queen, Inc., operated the Queen lead mine for the first 6 months of the year. The mine then was idle owing to litigation and financial difficulties.

*Whitehall District.*—Lead ore was shipped from the Carbonate and M & T mines. Gold ore was produced from the Golden Sunlight mine, which was under development by White Development Co.

**Judith Basin.**—An iron-ore-mining operation in the Little Belt Mountains near Stanford was begun by Young-Montana Corp. Ore was to be consigned to eastern metallurgical centers from the Running Wolf mine. According to company officials, the Running Wolf ore deposit contained reserves of 1 million tons of ore of the Bessemer lump type, averaging 60 percent iron. The open-pit site was cleared for mining, and drilling of test holes was in progress.

Sand and gravel was processed by Royston Gravel Co., Inc., of Moore. An article on the Yogo sapphire deposit appeared during the year.[10]

*Barker District.*—The Tiger lead mine (Croff & Montague) was again active in 1956.

*Yogo District.*—A small quantity of gold ore was shipped from the Yogo mine.

**Lake.**—Sand and gravel for building and paving purposes was prepared by the Clairmont Trucking Co. of Polson. The material came from the San Pablo reservoir area.

**Lewis and Clark.**—The East Helena smelter, American Smelting and Refining Co., operated throughout the year and processed lead ore and concentrate from Montana and Idaho mines, zinc-plant residues from Great Falls and Anaconda, and ore and concentrate from several foreign countries. Products were lead bullion, reverberatory furnace matte and speiss, and lead-bearing cadmium dust, all of which were consigned to other company plants for further processing. Adjacent

[10] Work cited in footnote 6.

Digitized by Google

to the smelter was the slag-fuming plant of the Anaconda Co., which recovered zinc fume by treating molten slag from the smelter and old slag from a dump.

Structural sand and paving gravel were produced by the Helena Sand & Gravel Co. and Valley Gravel Products, both of Helena, and by the Long Construction Co. of East Helena.

*Bear Gulch District.*—The Aurora lead mine was worked by Fred Schwarshaus during the last 6 months of 1956.

*Canyon Creek District.*—Gold ore was produced from the Empire mine, which was acquired early in 1956 by Montana Mining & Milling Co.

*Canyon Ferry District.*—Louis Peura operated the Nick & Dick lead mine and produced development ore by sinking a 90-foot incline winze and drifting 100 feet on a sublevel.

*Heddleston District.*—Two mines were active. Norman Rogers Mining Co. produced lead-zinc ore from the Mike Horse mine, and a small tonnage of gold-silver ore was shipped by Tillotson Bros. from the Midnight property.

*Lincoln District.*—The Gold Dollar gold mine supplied the only metal production of the district during development by Jack Parks from May 1 to November 1.

*Marysville District.*—Montana Rainbow Mining Co. terminated operations at the Drumlummon mine. Oscar Hoveland shipped a small tonnage of gold ore from the Bald Butte mine. Louis Peura worked the dump at the Little Ox property but later abandoned the property.

*Rimini District.*—Silver Crescent Mining Co. shipped lead-zinc ore from the Silver Crescent mine.

*Scratch Gravel District.*—Production was recorded at the Ajax gold mine.

*Smelter District.*—Lead and zinc recovered from old slag at The Anaconda Co. fuming operation was credited to Lewis and Clark County metal-production statistics and supplied a large portion of the metal production in the county.

*York District.*—Gold ore was shipped from the Frontier mine.

**Liberty.**—The bulk of the total crude-oil output (133,808 barrels worth $315,709) came from the Whitlash field. Minor contributions were made by three smaller fields. Almost 3.0 billion cubic feet of natural gas was withdrawn from the Whitlash, Utopia, and Keith Block fields. Major construction work was completed by the Bureau of Reclamation at its Tiber Dam project. Stone was quarried by contractors for use by the Bureau of Reclamation at Upper Missouri River projects. E. C. Powell produced paving gravel.

**Lincoln.**—The largest vermiculite producer in the Nation was operated 7 miles northeast of Libby by the Zonolite Co. A cleaned and screened product was exfoliated for use as insulation, as an aggregate, and for other purposes. The Great Northern Railway Co. produced gravel for ballast.

*Libby District.*—A joint rehabilitation and development project by St. Paul Lead Co., Inc., and Merger Mines Corp. reopened the Snowshoe mine. It was estimated that enough ore was in sight for operating at least 2 years. A British syndicate mined over $1 million worth of ore in 1900. A second joint venture in the district was

Digitized by Google

undertaken by Silver Star Mines, Inc., and Oro Syndicate for development of the St. Paul lead-zinc property. Blocked-out and indicated reserves were estimated at 10,000 tons. Stripping and diamond drilling of a tungsten deposit near Libby was done by Moose Hill Mining Co.

**Madison.**—Small shipments to Government low-grade stockpiles were made by the Ralph Boatman operation and the John T. McCale Lost Lode mine, both manganese properties. The Strawberry tungsten mine was active part of 1956.

Three producers—Tri-State Minerals Co. (Treasure State and Keystone mines), Sierra Talc & Clay Co. (Yellowstone mine), and American Chemet Corp. (mine near Alder)—supplied the talc output of the county.

*McCarthy Mountain District.*—Fred Starner operated the Big Bertha mine from January to July. Gold and some silver were recovered.

*Pony and South Boulder District.*—Basil and Denzil Nicholsen worked the Ridgeway gold mine from June to October and milled ore in a 3-stamp mill.

*Rabbit District.*—Production from the Daizy No. 1 mine and from the Diamond Hitch property, both lead mines, was recorded.

*Rochester District.*—Blaine Jensen (lessee) operated the Calvin lead mine. The Leodora mine was active also for a brief period.

*Sheridan District.*—Production from the Fairview gold mine was recorded.

*Tidal Wave (Twin Bridges) District.*—Silver ore was shipped from the Hawkeye mine, and some gold and silver was recovered from the High-Ridge mine.

**Meagher.**—The only nonmetal mining in the county was production of road gravel by contractors for the Bureau of Public Roads.

**Mineral.**—Uranium claims east of Saltese were under development by Western Resources, Inc.

Contractors produced paving and road gravel for the Bureau of Public Roads, and county highway department crews dug pit-run road gravel. In October Finlen & Sheridan Mining Co. began development at a fluorspar deposit on Fish Creek near the Montana-Idaho border.

*Cedar and Trout Creek District.*—E. T. Vincent and Clay Lewis operated a gold dredge on the Calumet placer and Cron's CB&Q placer during most of 1956. Placer gold also was produced from the Stemwinder property by hydraulicking and ground sluicing.

*Iron Mountain District.*—E. G. Smith (lessee) resumed production from the Iron Mountain mine and continued to operate the Nite Owl mine. Ore was processed at the Nancy Lee mill.

**Missoula.**—Shipments were made to Government low-grade stockpiles from the Pioneer Corp. Arrowhead manganese mine.

Three commercial sand and gravel operators produced these commodities at Missoula. Paving gravel and basalt for ballast were prepared by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. and stock-car sand and granite for riprap were processed by the Northern Pacific Railway Co. The barite mine and grinding plant of the Finlen & Sheridan Mining Co. were acquired and operated by the Baroid Sales Division, National Lead Co.

Digitized by Google

*Clinton (Wallace) District.*—Gold-silver ore was shipped from the Charcoal mine.

*Coloma District.*—U & W Uranium, Inc., leased the Royal mine in midyear and developed the property by a 600- by 85-foot cut. Copper ore was shipped crude to a smelter. Further development was planned at the mine, which consisted of three patented claims and mill buildings.

*Copper Cliff District.*—A small shipment of lead ore from the Blacktail mine was reported.

*Nine Mile District.*—William Lamon sank a 20-foot incline shaft at the Nine Mile gold mine and milled some sorted pay ore from the incline in a 15-ton Gibson rod mill. Gold recovered from stream gravel at the LaChambre placer was sold in 1956.

**Musselshell.**—The county maintained its second-place position in quantity of coal produced in the State. Ten underground mines contributed to the total, and each produced over 2,000 tons. Republic Coal Co. Klein No. 2 mine remained the leading producer. The other major producers were the Roundup Mining Co. Roundup No. 3 mine and Mountain States Mining Co. Montana Queen mine. Two oilfields—Big Wall and Ivanhoe—produced all but 90,000 barrels of the 570,000-barrel total, valued at $1.1 million. Three other fields were active. Sandstone for riprap was quarried by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

**Park.**—Granite for road metal, limestone for riprap, and paving gravel were produced for county use. Eggar Construction Service and Long Construction Co. prepared structural sand and paving gravel.

*New World District.*—Carter-Moreland Mining Co. produced silver ore from the Irma mine.

**Phillips.**—Withdrawals of natural gas from the Bowdoin field, which extends into Valley County, totaled 1.9 billion cubic feet. This output (2.8 billion cubic feet less than 1955) relegated the field to fourth position in the State. Structural sand and paving gravel were prepared by Gaylord LaFonde Sand & Gravel Co., Malta. Gravel for ballast and other purposes was furnished to the Great Northern Railway Co. The United States Army Corps of Engineers used paving gravel.

*Little Rockies District.*—Northern Mining & Milling Co. developed the Hawkeye open-pit gold mine and constructed a 75-ton flotation mill. Concentrate containing gold and some silver was recovered. Little Rockies Mining & Development Co. continued exploration and development at the Little Ben gold mine. No stoping was done, and the ore milled originated entirely from development, which comprised 574 feet of drifting, a 165-foot crosscut, and 112 feet of raises.

**Powell.**—Phosphate-rock production was continued by Montana Phosphate Products Co. at its Anderson underground and strip mines near Garrison. During the latter part of the year the company ceased operating the Graveley mine; the Luke and Gimlet mines were reported inactive all year. All of the mined product was shipped to chemical-fertilizer plants at Trail and Kimberley, British Columbia. A planer with a vibrating pneumatic blade, patterned after a fixed-blade device used for continuous longwall mining of narrow seams of friable coal, was designed by Bureau of Mines engineers and test-

Digitized by Google

operated at the Montana Phosphate Products Co. mine.[11] According to the report:

> It has been proved that phosphate rock of the character encountered at the Anderson Mine can be planed; and, although sustained high production has not yet been attained, some advantages of long-face planer mining already are apparent.

George Relyea operated his phosphate mine near Garrison. Limestone was burned to quicklime by the Elliston Lime Co., 18 miles west of Helena. Western Clay Manufacturing Co. made building brick from locally mined clay. Paving gravel was prepared by the Mastodon Sand & Gravel Co. at Deer Lodge.

*Nigger Hill District.*—Charter Oak Mining Co. operated its Charter Oak property from June to November. A new 50-ton flotation mill was equipped with lead-zinc circuits, but there was no separation of zinc in 1956 due to lack of a market. Wolfe and Hahn operated the Flora mine in the same area. John F. Hopkins worked the Negros lead mine for 1 month and shipped 6 tons of ore with gross content of 1 ounce of gold, 55 ounces of silver, and 1,400 pounds of lead. The Golden Anchor and the Third Term gold-silver-lead operations also were active.

*Pioneer District.*—Gold was recovered by Montana Gold & Chemical Co. by bucketline dredging and use of hydraulic giants at the Reservoir placer, 4 miles south of Gold Creek. The company controlled approximately 10,000 acres of placer ground in the vicinity. About 35,000 cubic yards of gold-bearing gravel was washed during 2½ months of operation.

**Ravalli.**—National Uranium Corp. and Hypotheek Mining & Milling Co. acquired the newly discovered Lucky Joe uranium prospect south of Darby under a purchase-option agreement. Uranium mineralization was said to occur in a greenish phyllite formation as pitchblende and on footwall quartzite fractures as uranophane. The vein structure was exposed by bulldozer trenching for a distance of 500 feet.

Fluorspar was mined by S. A. Cummings and H. E. Roberts (Cummings-Roberts) at the Crystal Mountain mine near Darby. A little more than half of the output, which was almost double the 1955 total, was used at steel plants and other metallurgical installations. The bulk of the balance was shipped to the GSA stockpile. A small quantity of sand and gravel was produced by county highway crews and for the United States Forest Service.

*Overwich District.*—Placer gold recovered in 1955 by hydraulicking on the Hughes Creek placer was marketed in 1956.

**Richland.**—Production of crude oil from the Brorson field was less than in 1955, marking the second consecutive year that output declined. The field began producing in 1953 and reached a high of over 75,000 barrels the next year. The Jennison Coal Co. mined lignite near Culbertson.

**Rosebud.**—The county ranked sixth in the State in total value of fuels and nonmetals during 1956. Total crude-oil output, all of which came from the Sumatra field, was 1.5 million barrels worth $3.4 million. This was only slightly less than in 1955. Coal production from the Rosebud mine of Northwestern Improvement Co. resulted

[11] Work cited in footnote 7.

Digitized by Google

in the county maintaining its position as the leading coal-producing county in Montana. The Lame Deer Mining Co. Lame Deer mine also was active. Paving gravel was prepared by contractors for the Bureau of Public Roads.

**Sanders.**—*Eagle District.*—The Jack Waite mine (operated under a profit-sharing agreement by American Smelting and Refining Co.), was 1 of 3 Montana mines producing more than 500 tons of lead in 1956. Lead-zinc ore was milled in a 250-ton flotation mill. Operations were resumed February 1 following settlement of a strike that idled the property nearly 6 months.

*Prospect Creek (Burns) District.*—Montana Standard Mining Co. continued operations at the Montana Standard lead-zinc mine and hauled crude ore over the Bitterroot Divide to the Golconda custom mill in Shoshone County, Idaho. High trucking costs and a short shipping season reduced mine output. Financial arrangements were under way for construction of a 75-ton flotation mill.

**Sheridan.**—Gravel for various purposes was produced by county road crews, contractors, and the Great Northern Railway Co. Two strip operations and one underground mine contributed to the lignite output that placed the county in first position for production of that commodity. The strip mines were the Lagerquist Coal and the Wolf Creek, owned by Elvin C. Lagerquist (Westby), and Medicine Lake Coal Co. (Plentywood), respectively. The Acme Coal Co. (Dagmar) operated the underground mine of the same name. Initial production of 2,751 barrels of crude oil valued at $6,327 was reported from the Outlook Area field.

**Silver Bow.**—Gold, silver, copper, lead, and zinc production of the Summit Valley (Butte) district supplied all but $7 million of the value of mineral production in Silver Bow County. Manganese also was produced in this district, and in other areas of the county manganese, phosphate rock, and sand and gravel were mined. Shipments to Government low-grade stockpiles were made from the following manganese mines: Brilliant, Bluebird, Burlington, Cumberland, Eagle Bird, Easter, Fredonia, Great Republic, Lavino, Magna Charta, Mapleton, Minnie Jane, Nettie-Hubernic, Norwich & Plutus, Olsen Fraction, Sankey group, Silver Clift, Tzarena, and Uinta. Umont Mining, Inc., received a DMEA loan to explore the Plutus & Norwich mine. Work at the mine, which formerly was operated by the partnership of Irving & Nelson, was to include diamond drilling and 1,000 feet of drifting. Stovell Manganese Co. acquired the Tzarena mine under lease and option, also from Irving & Nelson.

The Maiden Rock mine in this county and the Canyon Creek mine (Beaverhead County) furnished phosphate rock for conversion to elemental phosphorus at the Victor Chemical Works plant at Silver Bow. Pyrite from Silver Bow County base-metal ores was used at Anaconda, Deer Lodge County, for making sulfuric acid. Paving gravel was produced by county crews. Pioneer Concrete & Fuel, Inc., Butte, prepared structural sand and paving gravel.

*Summit Valley (Butte) District.*—Production of gold, silver, copper, lead, and zinc totaled $111 million, a 29-percent increase over 1955 and double the 1947–54 average. In addition, the value was the third highest on record, being exceeded only in 1916 ($127 million) and 1918 ($115 million). Copper yielded 74 percent of the value; zinc, 15

Digitized by Google

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in Silver Bow County, 1947–51 (average), 1952–56, and total, 1882–1956, in terms of recoverable metals

| Year | Mines producing | Material sold or treated (short tons) | Gold, lode and placer (fine ounces) | Silver, lode and placer (fine ounces) |
|---|---|---|---|---|
| 1947–51 (average) | 21 | 2,945,638 | 18,712 | 5,812,510 |
| 1952 | 21 | 4,425,605 | 16,930 | 5,518,197 |
| 1953 | 19 | 5,998,457 | 19,871 | 6,289,415 |
| 1954 | 22 | 4,987,849 | 17,395 | 4,663,439 |
| 1955 | 22 | 7,159,693 | 22,262 | 5,577,999 |
| 1956 | 21 | 9,394,981 | 31,132 | 6,772,380 |
| 1882–1956 | | (1) | 2,227,345 | 603,668,960 |

| Year | Copper (pounds) | Lead (pounds) | Zinc (pounds) | Total value |
|---|---|---|---|---|
| 1947–51 (average) | 112,608,660 | 27,063,360 | 114,131,980 | $51,022,909 |
| 1952 | 123,118,000 | 32,324,000 | 151,936,000 | 65,806,893 |
| 1953 | 155,040,000 | 33,534,000 | 180,340,000 | 72,566,257 |
| 1954 | 118,480,000 | 23,032,000 | 107,054,000 | 54,498,289 |
| 1955 | 162,856,000 | 28,662,000 | 125,176,000 | 86,240,115 |
| 1956 | 192,584,000 | 29,978,000 | 126,750,000 | 111,138,462 |
| 1882–1956 | [2] 7,201,425 | [2] 376,285 | [2] 2,186,727 | 3,244,776,571 |

[1] Data not available.
[2] Short tons.

percent; silver, 6 percent; lead, 4 percent; and gold, 1 percent. The district supplied more than half of the value of Montana mineral production. Ore output was 9.4 million tons, highest on record, due to the huge tonnages of low-grade ore from the Kelley mine and initiation of open-pit mining at the Berkeley project. About 7.9 million tons of copper ore was mined and processed; and production of lead-zinc ore totaled 1.5 million tons, including 400,000 tons of manganese ore, which yielded a lead-zinc-middling product.

The Butte Hill operations of The Anaconda Co. also contributed the bulk of the manganese ore mined in Montana. Output was consigned to the manganese mill and nodulizing plant at Anaconda. The Anaconda Co. annual report disclosed production of 90,614 tons of nodules and 44,714 tons of ferromanganese. A study of the oxidation and enrichment of the Butte manganese deposits was published.[12] Production of copper ore was curtailed in November and December, as the result of price reductions from 46 cents to 36 cents per pound of refined metal by the major producers. The curtailment was effected by reducing the work week from 6 to 5 days and by closing the Belmont mine; however, production remained above the 1955 monthly average. Production of copper ore from the new Berkeley pit totaled 1.9 million tons and production by block caving at the Kelley mine totaled 4.3 million tons. Output of high-grade copper ore, mainly from the Mountain Con mine, was 1.4 million tons. The Gagnon pit yielded 46,000 tons, and 58,000 tons was recovered from the East Colusa pit. A total of 4,413 tons of mine-water precipitate (cement copper) was recovered.

[12] Work cited in footnote 4.

Digitized by Google

Production of ore from the Berkeley pit, in the southeastern part of the district, began in December 1955. By early 1956 ore was being mined at the rate of 5,000 tons per day; in addition, 55,000 tons of waste per day was being removed, making a total of 60,000 tons handled each day. It was estimated that 185 million tons of waste eventually would be removed. The waste material averaged 250 feet in thickness, and the ore beneath was 200 feet in depth. At the end of 1956 ore production averaged 10,000 tons daily, and this rate was to be increased to 17,500 tons by mid 1957.

At the Kelley mine (Greater Butte project), production was at the capacity rate of 15,000 tons of ore daily. Measured reserve of ore was 180 million tons, containing 1 percent copper, and as much as 100 million tons more of reserves was indicated. Work was initiated on the Northwest project in 1956 to develop huge reserves of low-grade copper and zinc ores in outlying areas of the Butte Hill. Preliminary work was completed in connection with sinking of two new shafts—Ryan and Missoula. The Missoula shaft was to be an auxiliary hoisting and service shaft. Production through the main Ryan shaft was scheduled for late in 1959.

The Marget Ann gold-silver mine of Mitchell Mining Co. was active part of the year; production declined from the 1955 total.

**Stillwater.**—Production of chromite ore and concentrate was continued by the American Chrome Co. at the Mouat mine to fulfill requirements of the company contract with GSA. Extensive diamond drilling from the lowest mine level delineated tonnage and grade of ore at greater depth, and it was planned to sink a 3-compartment shaft 550 feet to develop this ore. A research program also was in progress to examine the practicability of a ferrochromium smelter near the mine site. The most important chromite deposits in the United States are found in Stillwater and Sweet Grass Counties. A report published in 1956 gave results of electric smelting tests of low-grade chromite concentrate from the area.[13] The report indicated that ferrochromium acceptable in regular steel-mill alloy practice could be prepared from the concentrate, which has a Cr-Fe ratio lower than generally is used by the trade.

Output from the Lake Basin field totaled 3,718 barrels of crude oil valued at $7,957. This was a little more than double the 1955 yield.

**Sweet Grass.**—The Long Construction Co. prepared a small quantity of paving gravel.

*Independence District.*—Lead ore was shipped from the Half Moon property.

**Treasure.**—County highway crews mined and processed gravel for paving purposes.

**Yellowstone.**—Recovery of crude oil from the Wolf Springs field increased from 23,000 barrels in 1955 (initial output) to 412,949 barrels valued at $879,581 in 1956. The Mosser field accounted for the balance of the total county production (422,806 barrels worth $896,831). The Great Northern Railway Co. produced gravel for railroad ballast. Four commercial operators prepared structural and paving sand and gravel.

---

[13] Walsted, J. P., Electric Smelting of Low-Grade Chromite Concentrates: Bureau of Mines Rept. of Investigations 5268, 1956, 28 pp.

Digitized by Google

The first recovery of high-purity sulfur in the State from oil refinery residual gases was reported by Montana Sulphur & Chemical Co. at Billings. Plant construction, which began in the early part of the year, was completed in June. Heavy clay products were made from locally mined clay by Lovell Clay Products Co., Billings. A small quantity of sandstone for riprap was quarried by contractors for the Bureau of Reclamation.

Digitized by Google

# The Mineral Industry of Nebraska

By D. H. Mullen[1]

MINERAL production in Nebraska in 1956 continued its upward trend and established a record for the ninth consecutive year. The value of all minerals produced in 1956 was $71.8 million, a 32-percent increase over 1955. Mineral fuels as a group (petroleum, natural gas, and natural-gas liquids) increased 45 percent in value of output over 1955 and represented 70 percent of the total mineral production of the State. Petroleum increased 47 percent, natural gas 11 percent, and natural-gas liquids 72 percent in value of output over 1955.

Of the nonmetallic minerals produced, cement ranked first in value, followed by sand and gravel, stone, clays, pumice, and gem stones. Gains in value of output were reported for all the nonmetallic minerals except stone, which decreased 1 percent in value. Cement production increased 8 percent in value, sand and gravel 20 percent, clays 2 percent, pumice 10 percent, and gem stones 25 percent over 1955.

**TABLE 1.—Mineral production in Nebraska, 1955–56[1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 150,835 | $150,835 | 153,137 | $153,549 |
| Gem stones | (2) | 2,400 | (2) | 3,000 |
| Natural gas.....million cubic feet | 12,515 | 2,553,000 | 13,541 | 2,844,000 |
| Petroleum (crude).....thousand 42-gallon barrels | 11,203 | 30,810,000 | 16,204 | 45,209,000 |
| Sand and gravel | 8,405,197 | 6,192,797 | 10,350,000 | 7,403,925 |
| Stone | 3,081,247 | 4,177,361 | 3,062,691 | 4,141,813 |
| Value of items that cannot be disclosed: Cement, natural-gas liquids, and pumice | ---------- | 11,143,474 | ---------- | 12,771,949 |
| Total Nebraska[3] | ---------- | 54,237,000 | ---------- | 71,776,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] The total has been adjusted to eliminate duplication in the value of raw materials used in the manufacture of cement.

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.



Digitized by Google

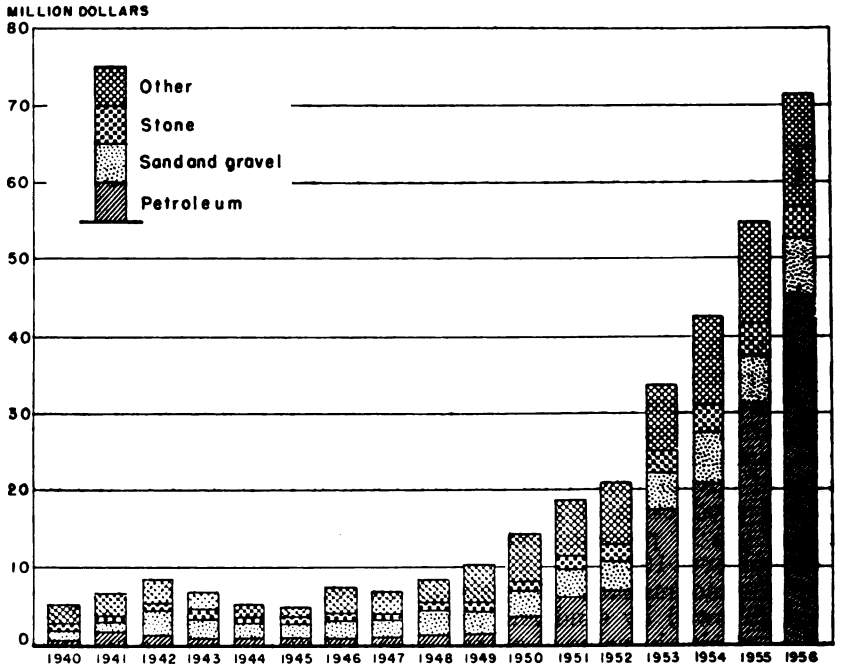



FIGURE 1.—Value of petroleum, sand and gravel, and stone, and total value of mineral production in Nebraska, 1940–56.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Natural Gas.**—Natural gas was produced from oil and gas wells in Banner, Cheyenne, Deuel, and Kimball Counties. Cheyenne County continued to be the leading producer. Marketed production in 1956 was 13,500 million cubic feet; the 8-percent increase over 1955 came principally from the Huntsman and S. W. Sidney fields in Cheyenne County and the Big Springs field in Deuel County. Gas produced in Banner and Kimball Counties was repressured, flared, or otherwise wasted. One gas discovery was made when Shell Oil Co. completed its No. 1 State well in Cheyenne County 4.5 miles west of the Peetz field, the nearest gas producer.

**Natural-Gas Liquids.**—A cycle plant at Huntsman field in Cheyenne County processed natural gas from the Huntsman and S. W. Sidney fields. Recovery of natural gasoline, butane, and lighter fractions increased 73 percent over 1955.

**Petroleum.**—Production of petroleum in 1956 was 16,204 thousand barrels, a 45-percent increase over 1955. Output was reported from the following counties, listed according to rank as producers: Kimball, Cheyenne, Banner, Morrill, Richardson, Garden, and Red Willow. Garden and Red Willow Counties began producing oil in 1956. Harlan County produced a small quantity of petroleum in 1955 but none in 1956. Wells in Richardson County, the first

Digitized by Google

county to produce oil in the State, yielded about 1 percent of the total output.

Exploration and development drilling continued to be widespread in 1956. Of the 465 wildcats completed 40 were oil wells and 1 was a gas well. Footage drilled totaled 2.5 million feet, and the success ratio was 1 : 11.6. Of the 470 field-development wells, 262 were successful. Footage drilled was 2.8 million feet. Exploration was north toward the Chadron arch and east toward the Cambridge arch. A significant discovery was the No. 1 Barger well completed in Red Willow County in the Lansing-Kansas City formation of Pennsylvanian age. Previous exploration along the Cambridge arch near the Kansas State line had been encouraging, and a well in Hitchcock County was designated a discovery in 1955. The well was abandoned early in 1956, when tests failed to show sustained recovery at commercial rates. The discovery of the Barger field intensified exploration toward the Cambridge arch. A second significant discovery was the No. 1 Richards well completed in Garden County. This well was on the northeast flank of the Denver-Julesburg basin, 20 miles northeast of the area of present production. The discovery intensified exploration north and east toward the Chadron arch.

Kimball County ranked first in both exploratory and development drilling, followed by Banner, Cheyenne, Morrill, Garden, Scotts Bluff,

**TABLE 2.—Wildcat and development well completions in 1956, by counties**

| County | Oil | Gas | Dry | Total | Footage |
|---|---|---|---|---|---|
| Wildcat: | | | | | |
| Arthur | | | 2 | 2 | 6, 400 |
| Banner | 8 | | 81 | 89 | 533, 900 |
| Box Butte | | | 8 | 8 | 28, 700 |
| Chase | | | 4 | 4 | 20, 700 |
| Cheyenne | 2 | 1 | 57 | 60 | 310, 400 |
| Custer | | | 2 | 2 | 7, 400 |
| Dawes | | | 4 | 4 | 14, 000 |
| Deuel | | | 5 | 5 | 19, 100 |
| Frontier | | | 1 | 1 | 4, 300 |
| Garden | 2 | | 12 | 14 | 51, 600 |
| Harlan | | | 2 | 2 | 7, 800 |
| Hayes | | | 2 | 2 | 9, 200 |
| Hitchcock | | | 9 | 9 | 38, 700 |
| Keith | | | 1 | 1 | 3, 700 |
| Kimball | 23 | | 144 | 167 | 1, 045, 700 |
| Lincoln | | | 1 | 1 | 4, 300 |
| McPherson | | | 1 | 1 | 3, 100 |
| Morrill | 4 | | 36 | 40 | 184, 800 |
| Perkins | | | 3 | 3 | 11, 200 |
| Red Willow | 1 | | 9 | 10 | 39, 800 |
| Scotts Bluff | | | 13 | 13 | 71, 100 |
| Sioux | | | 3 | 3 | 16, 200 |
| Eastern Nebraska | | | 24 | 24 | 74, 000 |
| **Total wildcat** | 40 | 1 | 424 | 465 | 2, 506, 000 |
| Development: | | | | | |
| Banner | 74 | | 38 | 112 | 669, 300 |
| Cheyenne | 41 | | 32 | 73 | 364, 300 |
| Deuel | | | 1 | 1 | 3, 700 |
| Frontier | | | 1 | 1 | 4, 200 |
| Garden | | | 5 | 5 | 17, 200 |
| Harlan | 1 | | | 1 | 3, 700 |
| Hitchcock | | | 1 | 1 | 4, 200 |
| Kimball | 127 | | 114 | 241 | 1, 623, 000 |
| Morrill | 16 | | 6 | 22 | 112, 900 |
| Red Willow | 1 | | 1 | 2 | 7, 700 |
| Eastern Nebraska | 2 | | 9 | 11 | 34, 000 |
| Total development | 262 | | 208 | 470 | 2, 844, 200 |
| **Total drilling** | 302 | 1 | 632 | 935 | 5, 350, 200 |

Digitized by Google

and Red Willow Counties. Exploratory drilling resulted in the discovery of 23 new fields in Kimball County, 8 in Banner County, 2 in Cheyenne County, 4 in Morrill County, 2 in Garden County, and 1 in Red Willow County.

Geophysical (seismorgaph and gravimeter) activity increased from 117 crew-weeks in 1955 to 141 crew-weeks in 1956. Gravimeter work was done by Honolulu Oil Co., with 20 crew-weeks each in Garden and Morrill Counties and 5 crew-weeks in Red Willow County. Seismograph work was done by various companies in all producing counties. Most of the geophysical activity, however, was away from the producing area of the Denver-Julesburg basin and toward the Chadron arch to the north and east. Principal areas of activity in other than producing counties were in Arthur, Box Butte, Dawes, Grant, Keith, Scotts Bluff, and Sioux Counties.

The refinery at Scotts Bluff operated throughout the year. The refinery at Salem in Richardson County was shut down.

## NONMETALS

**Cement.**—Shipments of portland and masonry cements increased 1 percent over 1955. Portland-cement shipments (types I and II) increased 2 percent and masonry-cement shipments decreased 23 percent. An increase in highway construction caused the increase in shipments of portland cement, whereas a decline in construction of dwellings caused the decreased demand for masonry cement. Production came from plants in Cass and Nuckolls Counties that were operated at 95 percent of capacity. Limestone, shale, and other materials used in portland and masonry cements were produced from quarries near the plants and from nearby deposits in Kansas. The 7 kilns in operation at the 2 plants consumed 56 million kilowatts of electricity. The bulk of the shipments went to Nebraska (79 percent), followed by Iowa (17 percent), and smaller shipments went to Kansas, Minnesota, South Dakota, Missouri, North Dakota, and Colorado. The price of portland cement in 1956 was $3.03 a barrel compared with $2.82 in 1955.

**Clays.**—Miscellaneous clay for the manufacture of building brick, drain tile, other heavy clay products, and portland cement were mined in seven counties. Stoneware clay produced in Cass County was used exclusively for the manufacture of art pottery and flowerpots. Production in 1956 was 2 percent above 1955.

**Gem Stones.**—Chalcedony, agate, jasper, and similar gem stones were recovered by individual collectors in Sioux County. The estimated value in 1956 was $3,000—an increase of 25 percent over 1955.

**Perlite.**—Crude perlite produced in the Western States was expanded at a plant in Omaha. The expanded product was used in prepared plasters and as lightweight aggregate in concrete.

**Pumice.**—Pumicite, as windblown volcanic ash, was produced from pits near Callaway in Custer County. A small quantity was marketed as mined, but the major portion was washed, dried, and sized. The principal uses were for scouring soaps and powders, for abrasives, and as an oil absorbent. Production in 1956 increased 7 percent and value 10 percent over 1955.

**Sand and Gravel.**—Sand and gravel was produced in 58 counties. Commercial production was reported in 54 counties and Government-

Digitized by Google

and-contractor production in 20 counties. Principal production came from the valleys of the Platte and Missouri Rivers. Other production came from the Republican River Valley and its tributaries. Sarpy County ranked first in the value of its output of sand and gravel, followed by Douglas, Dodge, Cass, Platte, and Buffalo Counties. Production in 1956 was 10,350,000 tons (an increase of 23 percent over 1955) and represented 11 percent of the value of Nebraska's mineral production. Paving and road construction used 60 percent of the output, building 39 percent, and engine and filter sand and railroad ballast 1 percent.

Government-and-contractor operators produced 12 percent of the sand and gravel used for paving and road building—7 percent of the total production of the State. Ninety-six percent of the commercial production was washed, screened, or otherwise prepared, whereas only 70 percent of the Government-and-contractor production was prepared. Most of the sand and gravel was transported by truck (67 percent) and the remainder by railroad. Seven operators—Christensen Sand & Gravel Co., Gerhold Co., Inland Construction Co., Lincoln Sand & Gravel Co., Lyman-Richey Sand & Gravel Corp., Albert H. Niedfelt, contractor, and Western Sand & Gravel Co.—produced 51 percent of the State's output.

**TABLE 3.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| Class of operation and use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 1,402,906 | $998,755 | $0.71 | 3,295,000 | $2,311,100 | $0.70 |
| Paving | 1,037,660 | 629,775 | .61 | 1,948,000 | 1,373,075 | .70 |
| Engine | 84,840 | 49,026 | .58 | 6,500 | 4,875 | .75 |
| Filter | | | | 1,000 | 750 | .75 |
| Railroad ballast | 17,478 | 5,707 | .33 | 96,000 | 72,000 | .75 |
| Other | 10,738 | 1,900 | .18 | 7,000 | 5,250 | .75 |
| Gravel: | | | | | | |
| Building | 1,701,460 | 1,296,874 | .76 | 714,500 | 561,625 | .79 |
| Paving | 3,547,557 | 2,919,942 | .82 | 3,524,000 | 2,591,375 | .74 |
| Other | 45,678 | 56,917 | 1.25 | 29,000 | 22,875 | .79 |
| Total commercial sand and gravel | 7,848,317 | 5,958,896 | .76 | 9,621,000 | 6,942,925 | .72 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 7,032 | 2,979 | .42 | | | |
| Paving | 160,242 | 40,045 | .25 | 137,500 | 76,000 | .55 |
| Gravel: Paving | 389,606 | 190,877 | .49 | 591,500 | 385,000 | .65 |
| Total Government-and-contractor sand and gravel | 556,880 | 233,901 | .42 | 729,000 | 461,000 | .63 |
| Grand total | 8,405,197 | 6,192,797 | .74 | 10,350,000 | 7,403,925 | .72 |

**Stone.**—Dimension limestone, crushed limestone, and crushed sandstone—produced in 9 counties—comprised 6 percent of the value of the State's mineral production. Dimension limestone (rough construction stone and rubble) was produced in Cass, Lancaster, and



Digitized by Google

Sarpy Counties. The output was 70 percent below 1955. Crushed limestone used for riprap, concrete aggregate and road construction, agriculture, manufacture of cement, and other purposes was produced in Cass, Gage, Lancaster, Nemaha, Pawnee, Sarpy, and Seward Counties. Cass County was the leading producer followed by Pawnee, Sarpy, and Nemaha Counties. The quantity produced in 1956 was approximately the same as in 1955.

Crushed sandstone used for riprap was produced in Franklin County. The quantity produced in 1956 was 40 percent below 1955. Total output of all stone in 1956 was 3.1 million tons, a 1-percent decrease compared with 1955. Leading producers of stone in 1956 were Ash Grove Lime & Portland Cement Co., Hopper Bros. Quarries, Geroge W. Kerford Quarry Co., Nelson Quarries, Inc., and Olson Quarries, Inc.

**Talc.**—Crude talc from deposits in California and Montana was ground at a plant at Grand Island. The ground product was used in ceramics, paint (as a filler), paper, textiles, and toilet preparations.

**Vermiculite.**—Crude vermiculite from Montana was exfoliated at a plant at Omaha for use as insulation and lightweight aggregate.

## REVIEW BY COUNTIES

**Adams.**—Western Brick & Supply Co. produced miscellaneous clay for manufacturing building brick and other heavy clay products at Hastings. L. J. Vontz produced paving gravel. Paving sand and gravel was produced for the State highway department, the Adams County Highway Department, and the city of Hastings by Robert Hohlfeldt, Ed Lilley, and Lippincott Construction Co. The county ranked fourth in the production of clay.

**Banner.**—Banner County ranked third in Nebraska in value of petroleum production and fourth in value of mineral output. Petroleum came from 16 fields, of which 8 were discovered in 1956. Principal producing fields were the Harrisburg, Olsen, Vedene, Lovercheck, Vowers, Petroleum-State, and Downer. The county highway department produced paving gravel.

**TABLE 4.—Value of mineral production in Nebraska, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adams | $147,842 | $112,885 | Sand and gravel, clays. |
| Banner | (2) | (2) | Petroleum, sand and gravel. |
| Boone | 14,826 | (2) | Sand and gravel. |
| Box Butte | ---------- | 2,000 | Do. |
| Boyd | 4,000 | 11,000 | Do. |
| Brown | 23,526 | 40,750 | Do. |
| Buffalo | 142,386 | 326,750 | Do. |
| Butler | 14,495 | 39,500 | Do. |
| Cass | 10,480,619 | 11,006,580 | Cement, stone, sand and gravel, clays. |
| Cedar | 47,708 | 89,500 | Sand and gravel. |
| Cheyenne | (2) | (2) | Petroleum, natural-gas liquids. |
| Clay | 57,892 | 101,375 | Sand and gravel. |
| Colfax | 48,881 | 75,400 | Do. |
| Cuming | 123,870 | 99,250 | Do. |
| Custer | (2) | (2) | Pumice. |
| Dawes | ---------- | 200 | Clays. |
| Dawson | 137,240 | 214,250 | Sand and gravel. |
| Deuel | (2) | ---------- | |

See footnotes at end of table.

Digitized by Google

TABLE 4.—Value of mineral production in Nebraska, 1955–56, by counties [1]—Con.

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Dixon | $12,509 | $18,250 | Sand and gravel. |
| Dodge | 524,717 | 689,750 | Do. |
| Douglas | 1,063,708 | 895,287 | Sand and gravel, clays. |
| Dundy | 8,971 | 12,000 | Sand and gravel. |
| Fillmore | 45,515 | 21,000 | Do. |
| Franklin | 40,554 | 81,275 | Sand and gravel, stone. |
| Frontier | 173 | | |
| Furnas | 66,716 | (2) | Sand and gravel. |
| Gage | 85,869 | 91,638 | Sand and gravel, stone. |
| Garden | | (2) | Petroleum. |
| Garfield | 2,288 | | |
| Gosper | 5,042 | | |
| Hall | 139,791 | 255,000 | Sand and gravel. |
| Hamilton | 50,487 | 51,250 | Do. |
| Harlan | (2) | 61,000 | Do. |
| Hayes | 14,379 | 16,750 | Do. |
| Hitchcock | 24,276 | 39,250 | Do. |
| Holt | 54,009 | 64,000 | Do. |
| Howard | | 14,250 | Do. |
| Jefferson | 162,817 | 208,355 | Sand and gravel, clays. |
| Kearney | (2) | (2) | Sand and gravel. |
| Keith | 14,077 | 75,000 | Do. |
| Kimball | (2) | (2) | Petroleum, sand and gravel. |
| Knox | 7,500 | 50,250 | Sand and gravel. |
| Lancaster | 202,204 | 240,808 | Stone, clays. |
| Lincoln | 5,590 | 17,250 | Sand and gravel. |
| Loup | 15,006 | 62,625 | Do. |
| Madison | 21,594 | 95,625 | Do. |
| Merrick | 52,890 | 9,000 | Do. |
| Morrill | (2) | (2) | Petroleum, sand and gravel. |
| Nance | 2,793 | | |
| Nemaha | (2) | 439,617 | Stone. |
| Nuckolls | (2) | (2) | Cement, sand and gravel. |
| Otoe | 12,575 | 7,646 | Clays. |
| Pawnee | 566,038 | 534,304 | Stone. |
| Perkins | 8,067 | 24,280 | Sand and gravel. |
| Phelps | 73,286 | | |
| Pierce | 82,950 | (2) | Sand and gravel. |
| Platte | 315,747 | 346,750 | Do. |
| Polk | | 40,500 | Do. |
| Red Willow | 114,773 | 87,629 | Sand and gravel, petroleum. |
| Richardson | 524,376 | 648,841 | Petroleum, stone, sand and gravel. |
| Saline | 69,024 | 65,500 | Sand and gravel. |
| Sarpy | 347,666 | 1,326,314 | Sand and gravel, stone. |
| Saunders | 68,903 | (2) | Sand and gravel. |
| Scotts Bluff | 55,864 | 96,000 | Do. |
| Seward | (2) | 361,000 | Sand and gravel, stone. |
| Sioux | 3,600 | (2) | Sand and gravel, gem stones. |
| Stanton | 51,325 | (2) | Sand and gravel. |
| Thayer | (2) | (2) | Do. |
| Thurston | | (2) | Do. |
| Valley | 143,537 | 38,750 | Do. |
| Webster | 5,001 | 20,500 | Do. |
| York | 24,450 | (2) | Do. |
| Undistributed [3] | 38,376,125 | 53,350,582 | |
| Total [4] | 54,237,000 | 71,776,000 | |

[1] The following counties are not listed because no production was reported: Antelope, Arthur, Blaine, Burt, Chase, Cherry, Dakota, Grant, Greeley, Hooker, Johnson, Keya Paha, Logan, McPherson, Rock, Sheridan, Sherman, Thomas, Washington, Wayne, and Wheeler.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[3] Includes petroleum, cement, sand and gravel, natural gas, natural-gas liquids, stone, pumice, and gem stones not assigned to specific counties and values indicated by footnote 2.

[4] Total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement.

**Buffalo.**—Building and paving sand and gravel and well-packing gravel were produced by Bruner Bros., Harry Johnson, Paul Sawyer Sand & Gravel Co., Carl Whitney, and Whitney Sand & Gravel Co. The county highway department produced paving gravel. The county ranked sixth in the State in the value of sand and gravel production.

Digitized by Google

**Cass.**—Cass County ranked third in the State in the value of mineral production—first in cement and stone, second in clays, and fourth in sand and gravel. Ash Grove Lime & Portland Cement Co. produced types I and II portland cement and masonry cement at its plant at Louisville. Portland cement was used as a base for manufacturing masonry cement. The company produced limestone and shale from deposits near the plant. Kahler Pottery Co., Inc., produced stoneware clay for art pottery and flowerpots. Crushed limestone for riprap, concrete aggregate and roadstone, agriculture, filler, and other uses was produced by Cass Co.-Contractors; Chicago, Burlington & Quincy Railroad Co.; Kelly Bros. & Co.; George W. Kerford Quarry Co.; Olson Quarries, Inc.; United Mineral Products Co.; and Western Limestone Products Co., Inc. Kelly Bros. & Co. produced limestone rubble. Cunningham-Kiewit Co. and Eugene Luhr & Co. produced riprap for the United States Army Corps of Engineers. Building and paving sand and paving gravel were produced by Lyman-Richey Sand & Gravel Corp., at plants 5 and 6, and by Western Sand & Gravel Co., at its Cedar Creek and South Bend plants.

**Cheyenne.**—The county produced petroleum, natural gas, and natural-gas liquids and ranked second in the value of mineral production. Petroleum was produced in 47 fields, of which 2 were discovered in 1956. Principal producing fields were Maley, Dorman, Doran, Cook, Juelfs, and Rudolph. Natural gas was from the S. W. Sidney, Sunol, and Shell State fields; the last named field was discovered in 1956. Natural gas from oil wells in the Huntsman field was processed at the natural-gasoline plant of the Ohio Oil Co. to recover natural gasoline, butane, and other liquid-petroleum gases. Natural gas from other oilfields was repressured or flared.

**Clay.**—The Deweese Sand & Gravel Co. produced building sand and building and paving gravel. George K. Werner produced paving gravel for the State highway and county highway departments.

**Custer.**—LaRue-Axtell Pumice Co. produced pumicite from pits near Callaway for cleansing and scouring compounds and soaps, abrasives, and oil absorption. Production increased 7 percent and value 10 percent over 1955.

**Dawson.**—Sand and gravel for building, paving, railroad ballast, and well packing was produced by R. E. Davis, Cleo Hunt, C. Kirkpatrick & Son, Harold E. Kirkpatrick, and Overton Sand Co. The county ranked ninth in the State in the production of sand and gravel.

**Deuel.**—Natural gas was produced from wells in the Big Springs field. The county ranked second in the State in output of marketed natural gas.

**Dodge.**—Sand and gravel for building and paving was produced by Christensen Sand & Gravel Co., Lincoln Sand & Gravel Co., and Lux Sand & Gravel Co. The county ranked third in the State in the value of sand and gravel produced.

**Douglas.**—Douglas County ranked second in the State in the value of sand and gravel produced, fifth in the value of clays produced, and eighth in the value of mineral production. Building and paving sand, engine sand, railroad ballast, and building and paving gravel were produced by Acme Sand & Gravel Co., Hartford Sand & Gravel Co., Lyman-Richey Sand & Gravel Corp. (operating plants 9 and 11), and

Digitized by Google

J. W. McCann Co. Omaha Brick Works produced miscellaneous clay for manufacturing building brick and other heavy clay products. Western Mineral Products Co. expanded perlite from deposits in the Western States and exfoliated vermiculite from Montana deposits at plants in Omaha. The expanded perlite was used as a lightweight aggregate in plaster and concrete. Exfoliated vermiculite was used as loose-fill insulation and lightweight aggregate.

**Franklin.**—Bushman Construction Co. produced crushed sandstone for use as riprap. Amman Sand & Gravel Contractors and Bladen Sand & Gravel Co. produced building sand and paving gravel.

**Garden.**—Petroleum was produced for the first time in Garden County when the Richards and McCord fields were discovered in 1956. The fields are 20 miles northeast of existing producing areas, on the northeast flank of the Denver-Julesburg basin. Production was from cretaceous sandstones at a depth of about 3,200 feet; however, the gravity of the oil was 27.5°—considerably lower than that of other Denver-Julesburg basin oil. Although the two fields did not produce a large quantity of oil in 1956 (the county ranked sixth in the State in petroleum production), the discoveries extended the Denver-Julesburg basin 20 miles northeast and provided the incentive for more active exploration toward the Chadron arch.

**Hall.**—Building and paving sand and gravel, engine sand, and gravel for well packing were produced by Armour Construction Co.; East Ashton Sand & Gravel; H. & M. Equipment Co. (two plants); Albert H. Niedfelt, contractor; Riverside Sand & Gravel Co.; and Third City Sand Co. Lilley Sand & Gravel produced paving gravel for the county highway department. The county ranked eighth in the State in the value of sand and gravel output. The Sierra Talc & Clay Co. operated its grinding plant at Grand Island. Crude talc came from mines in Montana and California. The ground product was used in ceramics, in toilet preparations, and as a filler in paint, paper, and textiles. A fluid-energy mill was installed in 1956. Shipments increased 24 percent in quantity and 40 percent in value over 1955.

**Harlan.**—Petroleum was produced from 3 fields (1 well in each field) in Harlan County in 1955, but no production was reported in 1956. Exploratory drilling in 1956 was unsuccessful. One successful development well was completed in the Bantam field. Olson Gravel Co. produced building and paving gravel and gravel for well packing.

**Jefferson.**—Endicott Clay Products Co. and Western Brick & Supply Co. produced miscellaneous clay for manufacturing building brick and other heavy clay products. The county ranked third in the State in the value of clay production. Building and paving sand and gravel and gravel for well packing were produced by Consolidated Sand & Gravel Co., Steele Bros., Wagner & Roelf, and R. M. Weblemoe Co.

**Kimball.**—Kimball County was the leading producer of petroleum in the State. Production came from 70 fields, of which 23 were discovered in 1956. Major producing fields were Travis, Kimball, Long, Torgeson, Enders, and Sloss. Production increased 55 percent over 1955. Exploration and development drilling were widespread, and the county ranked first in number of wells completed. Natural gas

Digitized by Google

from oil wells was repressured or flared. Wilson Bros. Ready Mix produced building sand.

**Lancaster.**—Yankee Hill Brick Manufacturing Co. produced miscellaneous clay for manufacturing building brick and other clay products. Production in 1956 was 14 percent greater than in 1955. The county was the leading clay producer in the State. Schwarck Quarries, Inc., produced limestone rubble; limestone for riprap, concrete aggregate, and road construction; and agricultural lime. The county highway department mined crushed limestone for riprap and road construction.

**Morrill.**—Production of petroleum in Morrill County in 1956 increased more than twentyfold over 1955. The bulk of the output came from the Olsen field that extends into both Morrill and Banner Counties. Successful wildcat drilling resulted in the discovery of 4 new fields, making 6 producing fields in the county. The county ranked fourth in the State in the value of petroleum produced. Building and paving sand and engine sand were produced by Dolson Gravel Co. and Lyman-Richey Sand & Gravel Corp. (plant 23).

**Nemaha.**—Crushed limestone for riprap, concrete aggregate and roadstone, and agriculture was produced by Harmon Gravel Co., Heebner Quarries (Heidzig and Kyle quarries), and Nelson Quarries, Inc., Bower Construction Co., Costa Co., Inc., Eugene Luhr & Co., and Massman Construction Co. produced riprap for the United States Army Corps of Engineers.

**Nuckolls.**—The Ideal Cement Co., Nebraska Division, produced types I and II portland and masonry cements at its plant at Superior. Portland-cement clinker was used in manufacturing masonry cement. Limestone used at the plant was mined by the company at a quarry in Jewell County, Kans. C. F. Bondegard produced paving gravel and George K. Werner produced paving gravel for the county highway department.

**Pawnee.**—Pawnee County ranked second in the State in the value of crushed-stone production. Hopper Bros. Quarries produced crushed limestone for concrete aggregate and road construction and for agriculture.

**Platte.**—Ace Sand & Gravel Co., Albers & Anderson, Gerhold Co., and Lyman-Richey Sand & Gravel Corp. (plant 15) produced building and paving sand and paving gravel. The county ranked fifth in the State in the value of sand and gravel produced.

**Red Willow.**—Red Willow County entered the ranks of oil-producing counties when the No. 1 Barger well was completed early in 1956. The well produced 198 barrels a day on pump from the Lansing-Kansas City formation from perforations at 3,856 to 3,864 feet. This was the first substantial discovery on the Cambridge arch in southern Nebraska. A second well in the field (the No. 46–6 Stephens) also was completed and produced 194 barrels of oil a day on pump. Davidson-Merritt Sand & Gravel Co., Clarence A. Gillen, and Midwest Sand & Gravel Co. produced building and paving sand and gravel and filter sand.

**Richardson.**—Crushed limestone for riprap was produced by Costa Co., Inc., for the United States Army Corps of Engineers. The county highway department produced paving gravel. Petroleum

Digitized by Google

output came from four fields. The Searll Petroleum Corp. refinery at Salem was shut down in 1956.

**Sarpy.**—The county ranked first in the value of sand and gravel produced and fourth in the value of stone output. Lyman-Richey Sand & Gravel Corp. (plants 2, 7, 12, and 13), Olson Quarries, Inc., and Richfield Sand & Gravel Co. produced building and paving sand and gravel and engine sand from pits in the valleys of the Platte and Missouri Rivers. The board of county commissioners produced paving sand. General Rock, Inc., and Meadow Rock Co. produced dimension limestone, which was marketed as rough construction stone and rubble. Crushed limestone for riprap, concrete aggregate and road construction, and agriculture was produced by General Rock, Inc., Meadow Rock Co., and Stone Products Co.

**Scotts Bluff.**—The skimming and cracking plant of the Nebraska Consumers Cooperative Refinery Association at Scottsbluff operated throughout 1956. Crude oil came from eastern Wyoming fields and the Harrisburg field in Banner County. Building and paving sand and gravel was purchased by Albert H. Niedfelt, contractor; Platte Valley Cement Tile Manufacturing Co.; and Trettenero Sand & Gravel.

**Seward.**—Inland Construction Co. produced paving sand and gravel. Greenhorn Lime Products, Inc., produced agricultural limestone.

Digitized by Google

Digitized by Google

# The Mineral Industry of Nevada

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Nevada Bureau of Mines.**

By L. E. Davis,[1] E. J. Matson,[1] G. C. Branner,[1] and R. Y. Ashizawa[2]

ALL MINERALS produced in Nevada rose over 10 percent in value, exceeding the 1955 value by $13 million. Copper, tungsten, and manganese mines continued to supply the minerals that represented a large percentage of this value; but, in all, each of 15 major mineral commodities (9 metal and 6 nonmetal), was the basis for a million-dollar industry in 1956.

Most of the increase in quantity and value of the production over 1955 was attributed to the relatively high unit prices for most metals throughout the year. The quantity of copper produced was a near record, with a higher value than had been attained in any previous year for the metal in Nevada. The yield of tungsten concentrate declined from the previous year and reflected curtailment of Government purchases in the last half of the year. The output of manganese ore and concentrate continued large; in consequence, Nevada regained first place nationally in both tonnage and value in 1956.

A high percentage of the gold and silver output was accounted for as byproduct recovery through increased activity at copper, lead, and zinc mines in Lincoln and White Pine Counties. The quantity of gold recovered from those operations almost offset the decline in placer-gold production, as Nevada's leading 1955 placer mine did not operate in 1956. Increased silver production in 1956 was aided by reactivation of the Mohawk mine and Bruhi mill in the Silver Peak area, Esmeralda County, during the latter half of the year.

The greatly increased yield of iron ore in 1956 resulted from increased demand for high-grade ore in Japan. The high lead and zinc production for 1956 was due principally to stepped-up activity in the Pioche district, Lincoln County, and the shipment from Clark County of major tonnages of oxidized zinc ore (held in a Government stockpile since World War II) and of lead residue derived from manganese ore mined in the county.

Nevada mercury production, largely the yield of one mine and second only to California nationally, increased in quantity in 1956, despite a lower average unit value. Uranium activity continued high. During the year nine mining companies shipped ore to concentrators outside the State.

[1] Commodity-industry analyst, Region II, Bureau of Mines, San Francisco, Calif.
[2] Supervisory statistical assistant, Region II, Bureau of Mines, San Francisco, Calif.



Digitized by Google

**TABLE 1.—Mineral production in Nevada, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Barite | 113,694 | $708,804 | 178,440 | $1,066,930 |
| Clays | 6,155 | 13,385 | 13,960 | 31,806 |
| Copper (recoverable content of ores, etc.) | 78,925 | 58,878,050 | 82,883 | 70,450,550 |
| Gem stones | (2) | (2) | (2) | 50,000 |
| Gold (recoverable content of ores, etc.) fine ounces | 72,913 | 2,551,955 | 72,646 | 2,542,610 |
| Gypsum | 836,744 | 2,835,922 | 790,356 | 2,700,708 |
| Iron ore (usable) long tons, gross weight | 324,602 | [4] 1,667,098 | 916,592 | [4] 2,498,374 |
| Lead (recoverable content of ores, etc.) | 3,291 | 960,718 | 6,384 | 2,004,576 |
| Manganese ore (35 percent or more Mn) gross weight [3] | 101,469 | (3) | 121,482 | (3) |
| Mercury 76-pound flasks | 5,750 | 1,669,512 | 5,859 | 1,522,871 |
| Petroleum (crude) thousand 42-gallon barrels | 64 | 110,000 | 64 | 111,000 |
| Pumice | (2) | (2) | 11,534 | 34,516 |
| Sand and gravel | 3,580,260 | 3,762,384 | 4,686,513 | 4,868,693 |
| Silver (recoverable content of ores, etc.) fine ounces | 845,397 | 765,127 | 1,220,473 | 1,104,590 |
| Stone | 1,611,942 | 2,608,900 | 1,401,169 | 2,280,778 |
| Talc and soapstone | 10,732 | [5] 78,842 | 10,540 | 98,506 |
| Tungsten concentrate 60-percent $WO_3$ basis | 6,155 | 22,750,662 | 5,400 | 19,263,193 |
| Zinc (recoverable content of ores, etc.) | 2,670 | 656,820 | 7,488 | 2,051,712 |
| Value of items that cannot be disclosed: Antimony ore and concentrate (1956), brucite (1956), diatomite, fluorspar, lime, magnesite, calcareous marl, molybdenum concentrates (content), perlite, salt, sulfur ore, uranium ore (1956), and values indicated in footnote 3 | | 13,751,734 | | 14,403,557 |
| Total Nevada [7] | | 113,220,000 | | 126,233,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing company confidential data.
[4] 1955 value based on average value at the railhead and 1956 value based on average value f. o. b. mine.
[5] Shipments to Government low-grade depots and custom mills not included, but quantity and value for this material are as follows: 1955—manganese ore, 3,213 short tons, $262,142, and low-grade manganese ore, 1,254 short tons, $50,278; 1956—manganese ore, 612 short tons, $39,411, and low-grade manganese ore, 3,142 short tons, $140,270.
[6] Revised figure. Supersedes preliminary figure given in commodity chapter.
[7] Total has been adjusted to eliminate duplicating the value of stone.

**TABLE 2.—Average unit value of selected mineral commodities, 1947–51 (average) and 1952–56 [1]**

| Commodity | 1947–51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Copper cents per pound | 21.5 | 24.2 | 28.7 | 29.5 | 37.3 | 42.5 |
| Gold dollars per fine ounce | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 |
| Iron ore (average value at mine) dollars per long ton | 4.46 | 6.09 | 6.76 | 6.99 | 7.12 | 7.75 |
| Lead cents per pound | 15.92 | 16.1 | 13.1 | 13.7 | 14.9 | 15.7 |
| Mercury dollars per 76-pound flask | 106.22 | 199.10 | 193.03 | 264.39 | 290.35 | 259.92 |
| Silver cents per fine ounce | 90.5 | 90.5+ | 90.5+ | 90.5+ | 90.5+ | 90.5+ |
| Tungsten concentrate dollars per short-ton unit $WO_3$ | 33.07 | 63.44 | 62.46 | 62.61 | 61.79 | 57.90 |
| Zinc cents per pound | 13.8 | 16.6 | 11.5 | 10.8 | 12.3 | 13.7 |

[1] Prices are discussed in detail in the commodity chapters of vol. I, Minerals Yearbook.

Although most of the nonmetals produced in Nevada in 1956 increased in value, those more or less closely associated with home construction declined from 1955. This applied particularly to gypsum and lime, although the unit value of both commodities advanced slightly. The increased production of sand and gravel over 1955 was

Digitized by Google

due principally to the quantity of paving sand prepared for use at military bases in Churchill and Washoe Counties, and to the large tonnage of sand and gravel produced for railroad ballast in Lincoln County. The decline in quantity of stone quarried in 1956 was related directly to completion of a major municipal project for Las Vegas, Clark County, begun in 1955, which in that year required a very large tonnage of crushed granite.

The slightly lower quantity of diatomite mined in 1956 resulted in part from a higher market price that adversely affected about 60 percent of the sales. The marked increase in barite output over 1955 was accounted for by greater out-of-State demand for the mineral as a constituent in drilling fluids and the requirements of a California chemical plant that used the crude barite as a basis in producing various barium compounds.

The demand for export, and by eastern magnesia-refractory manufacturers, caused a slight increase in the tonnage of magnesite and brucite mined in 1956. Although fluorspar production was greater both in tonnage and value compared with 1955, the known deposits suitable for an Acid-grade product were nearing depletion at the end of the year.

The yield of petroleum was substantially the same as in 1955, as exploration continued with little success.

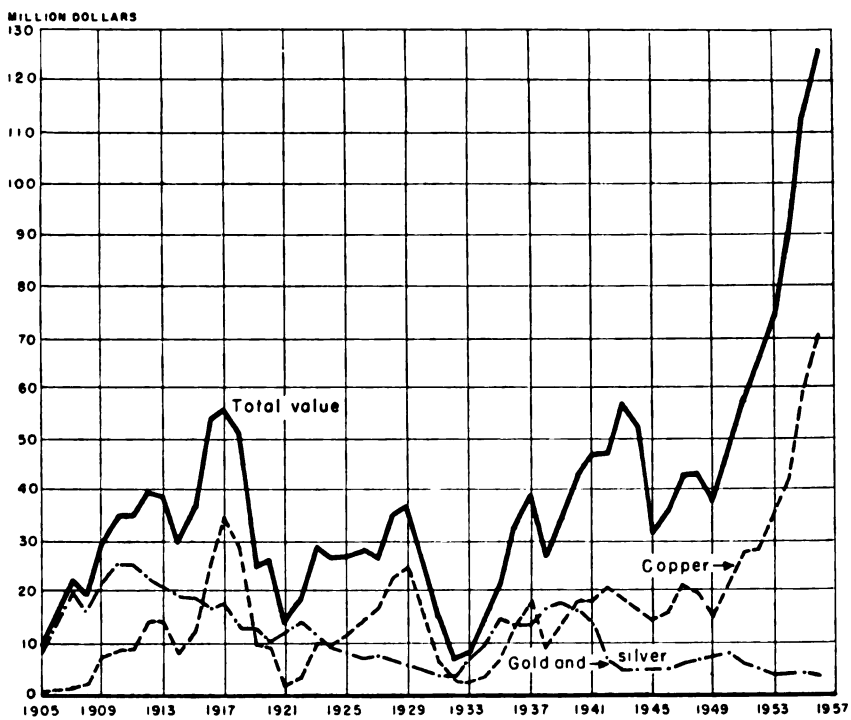



FIGURE 1.—Value of gold and silver, copper, and total value of mineral production in Nevada, 1905–56.

Digitized by Google

A comparatively small portion of the mineral production was consumed in the State because of limited industrial activity and a relatively small population.

Copper precipitate, concentrate, and some copper ore were shipped to out-of-State smelters. Nevada's only smelter, in White Pine County, received copper concentrate from the Kennecott mill and copper, gold and silver custom ores for fluxing on a custom basis from various mining districts throughout the State. The blister copper was shipped to eastern refineries. Tungsten ores were custom treated by mills in several counties and the concentrate sold to the Government for stockpiling or shipped to eastern consumers. Manganese

**TABLE 3.—Defense Minerals Exploration Administration contracts active during 1956**

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total amount | Government participation (percent) |
| ELKO | | | | | |
| Bounty & Sons | Monarch | Tungsten | May 23, 1955 | $6,500 | 75 |
| ESMERALDA | | | | | |
| Nelson, Nelson & Clair | 4 Aces | Lead, zinc | Mar. 30, 1955 | 8,436 | 50 |
| HUMBOLDT | | | | | |
| Apollo Mines, Inc. | Saddle | Tungsten | Sept. 14, 1955 | 14,520 | 75 |
| TNT, Inc. | Mountain Queen. | do. | Apr. 21, 1955 | 23,003 | 75 |
| LANDER | | | | | |
| Petersen, Lowe, Bush & Campbell. | Lost Chance | Manganese | Apr. 28, 1955 | 10,155 | 75 |
| LINCOLN | | | | | |
| Combined Metals Reduction Co. | Black Prince | Lead, zinc | Mar. 2, 1955 | 98,200 | 50 |
| Comet Mines, Inc. | Comet | do. | Apr. 16, 1952 | 190,000 | 50 |
| Consolidated Uranium Mines, Inc. | Schofield | Tungsten | June 24, 1954 | 77,035 | 75 |
| Milbank & Jones | Bristol | Copper-lead-zinc. | Aug. 13, 1956 | 82,250 | 80 |
| Raymond Combined Mines Co. | Prince Henry | Lead, zinc | Oct. 29, 1952 | 108,466 | 50 |
| Wah Chang Mining Corp. | Lincoln | Tungsten | Mar. 17, 1955 | 76,300 | 75 |
| Yuba Dike Mines, Inc. | Yuba Dike | Lead, zinc | May 17, 1955 | 21,750 | 50 |
| MINERAL | | | | | |
| Nevada Scheelite Corp. | Leonard | Tungsten | June 12, 1956 | 68,800 | 75 |
| NYE | | | | | |
| The Climax Tunsten Co. | Climax | do. | Oct. 30, 1956 | 66,320 | 75 |
| El Capitan Mining Co. | El Capitan | do. | Apr. 25, 1955 | 41,190 | 75 |
| PERSHING | | | | | |
| C. A. Coppin | Redbird | Mercury | July 5, 1955 | 31,310 | 75 |
| Cordero Mining Co. | Stormy Fraction. | Tungsten | July 23, 1956 | 24,120 | 75 |
| WHITE PINE | | | | | |
| Helmar Mining & Milling Co., Inc. | Teresa | Tungsten | Sept. 12, 1955 | 24,900 | 75 |
| M. I. A. Mines, Inc. | Minerva | do. | Jan. 27, 1953 | 171,400 | 75 |
| Mount Wheeler Mines, Inc. | Mount Wheeler. | Lead, zinc | Mar. 15, 1955 | 303,200 | 80 |
| Robert E. Salvi | Valley View | Tungsten | Nov. 2, 1955 | 16,400 | 75 |

Digitized by Google

ores were processed in the State or shipped to Government stockpiles.

Gold and silver producers shipped bullion directly to the United States Mint or consigned ores and concentrates to smelters. Lead and zinc ores and concentrates, without exception, were shipped to smelters outside of the State. Mercury producers sold directly to consumers and distributors most of whom were outside of Nevada. Although noteworthy tonnages of iron ore were shipped to eastern furances, most of the production was consigned to California brokers for export.

**TABLE 4.—Contracts for purchase of minerals and metals under the Defense Production Act, as of Dec. 31, 1956**

| Contractor | County | Commodity | Contingent purchase commitment (short tons) | Financing | |
|---|---|---|---|---|---|
| | | | | Amount | Type |
| Titanium Metals Corp. of America. | Clark | Titanium-sponge metal. | 1,500 | $15,000,000 | Advance. |
| Manganese, Inc. | do | Manganese nodules | [1] 83,0000 | | |

| Contractor | Tax amortization (percent) | Approximate term of contract (years) | Date production starts | Commitment purchase price |
|---|---|---|---|---|
| Titanium Metals Corp. of America | 90 | 5 | May 1, 1952 | $5.00 or market a pound.[2] |
| Manganese, Inc. | | 9 | Jan. 1, 1952 | $1.50 a long ton unit of contained Mn.[3] |

[1] Long tons.
[2] Sponge metal. Contract has clause to allow for differential between ingot and sponge purchased.
[3] Includes escalator clause.

Many producers disposed of nonmetals output at grinding plants in California; but some commodities (such as brucite, clays, diatomite, limestone, magnesite and perlite) were consumed or further processed in the State. A substantial tonnage of crude gypsum was converted to the finished product in Nevada. Some producers of marl or sulfur ore sold directly to farmers after crushing the crude material.

**Government Participation.**—Interest under the Defense Minerals Exploration Administration (DMEA) program was high during 1956. Twenty-one projects in 9 counties were active during all or part of the year. Twelve projects were for tungsten, 6 for lead-zinc, and 1 each for copper, manganese, and mercury. Bureau of Mines and Geological Survey teams, with headquarters at Reno, provided technical assistance and administered the program.

Two production contracts (1 each for manganese and titanium) negotiated by the Defense Materials Procurement Agency in 1952 were in effect during the entire year. One incentive contract for copper terminated in March 1956. The Government did not maintain General Services Administration (GSA) purchase depots in Nevada during the year. However, shipments of tungsten concentrate, manganese ores and concentrates, and low-grade manganese ores were made to GSA and stockpiled at out-of-State depots.

**Employment and Injuries.**—Employment in the mineral industries increased for the sixth consecutive year, and the total disabling in-

Digitized by Google

rates were the lowest recorded for the 6-year period. The average weekly earnings per employee were the highest and the average number of hours worked per man per week the shortest since the end of World War II. In all, 7,830 employees worked a 40-hour week in 1956, with an average weekly earning per employee of $93.60.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Antimony.**—A small quantity of antimony concentrate was shipped to a Texas smelter in 1956. It was recovered from ore mined in Pershing County several years previously. A small tonnage of ore was mined in Nye County and shipped to a mill in Lander County but was not processed. Several hundred tons of antimonial-lead ore from Mineral County was shipped to smelters in California and Utah. Smelter returns for the year showed that several tons of recoverable antimony metal was contained in base-metal ores and concentrates shipped from Nevada mines to smelters outside of the State. Interest in straight antimony ore mining remained low, owing to lack of nearby smelting facilities.

**Cadmium.**—Zinc concentrate produced from ores of the Pioche area (Lincoln County) contained an appreciable quantity of recoverable cadmium. The tonnage of cadmium recovered at zinc plants outside the State was undetermined, but was estimated to have been higher

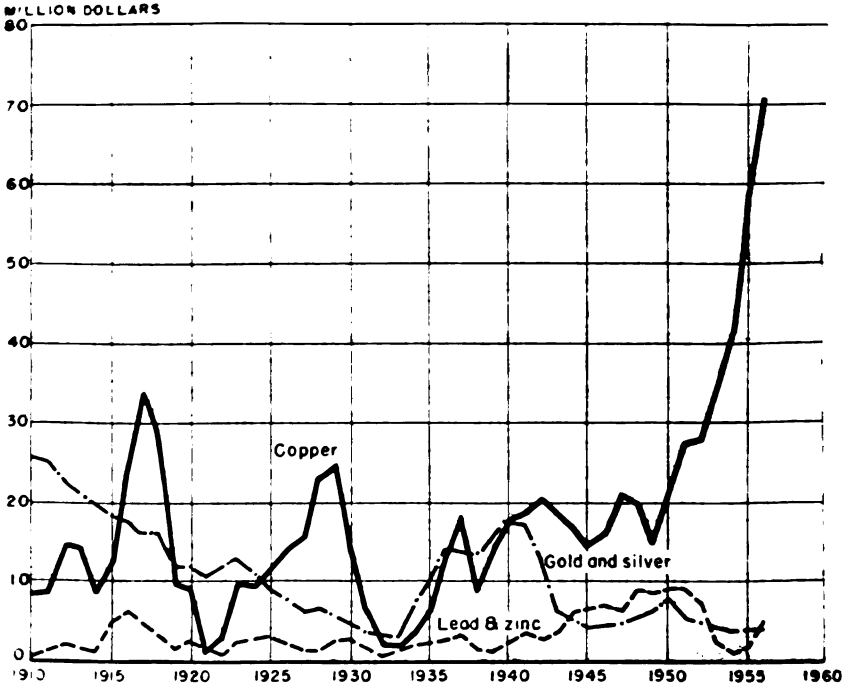



FIGURE 2.—Value of mine production of gold and silver, copper, and lead and zinc in Nevada, 1910–56.

Digitized by Google

than in 1955. The greater tonnage of zinc concentrate treated at Utah smelters accounted for the increased output of cadmium.

**Copper.**—Nevada copper production increased 5 percent above 1955 and was within 1 percent of the alltime high of 1942. The yield reflected the continued high unit price during the first half of the year. The copper mines of White Pine County contributed 60 percent of the State total, with Kennecott Copper Corp., Nevada Mines Division, in the Robinson district, the major producer. Kennecott's operations were confined to the Kimbley, Liberty and Veteran pits and the Minnesota-Hi underground ore body. The Minnesota-Hi ore, above and within the projected cave area of the Deep Ruth ore body, will be mined before deeper operations are begun. Consolidated Coppermines Corp., in the Robinson district adjoining Kennecott mining operations, was the State's third-ranking producer. Most of the company-mined ore was obtained from the Tripp pit, a consolidation of the Morris and Brooks pits.

The Anaconda Co. operations at the Yerington copper mine (Lyon County) continued throughout the year and maintained a close second in State production. The mined oxide ore was acid leached and the copper precipitated on iron scrap. The precipitate was shipped to the company smelter and refinery in Montana. Additional exploration by drilling was carried on during the year, which resulted in increasing the Yerington-ore reserves.

**TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1859–1956, in terms of recoverable metals [1]**

| Year | Mines producing [2] | | Material sold or treated [3] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 238 | 29 | 6,926,022 | 126,095 | $4,413,339 | 1,497,339 | $1,355,153 |
| 1952 | 114 | 11 | 7,313,697 | 117,203 | 4,102,105 | 941,195 | 851,829 |
| 1953 | 125 | 9 | 8,027,402 | 101,799 | 3,562,965 | 697,086 | 630,898 |
| 1954 | 119 | 17 | 9,843,202 | 79,067 | 2,767,345 | 560,182 | 506,993 |
| 1955 | 124 | 10 | 10,760,337 | 72,913 | 2,551,955 | 845,397 | 765,127 |
| 1956 | 132 | 5 | 12,300,484 | 72,646 | 2,542,610 | 1,220,473 | 1,104,590 |
| 1904–56 [4] | | | (5) | 14,764,230 | 364,767,153 | 312,941,890 | 214,203,582 |
| 1859–1956 [4] | | | (5) | 26,591,106 | 609,250,386 | 601,354,739 | 551,361,805 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 48,889 | $20,933,052 | 8,824 | $2,876,744 | 19,350 | $5,411,714 | $34,900,001 |
| 1952 | 57,537 | 27,847,908 | 6,790 | 2,186,380 | 15,357 | 5,098,524 | 40,086,746 |
| 1953 | 61,850 | 35,501,900 | 4,371 | 1,145,202 | 5,812 | 1,336,760 | 42,177,725 |
| 1954 | 70,217 | 41,428,030 | 3,041 | 833,234 | 1,035 | 223,560 | 45,759,162 |
| 1955 | 78,925 | 58,878,050 | 3,291 | 980,718 | 2,670 | 656,820 | 63,332,670 |
| 1956 | 82,883 | 70,450,550 | 6,384 | 2,004,576 | 7,488 | 2,051,712 | 78,154,038 |
| 1904–56 [4] | 2,374,100 | 843,828,592 | 377,386 | 58,694,783 | 476,600 | 91,914,460 | 1,573,408,570 |
| 1859–1956 [4] | 2,376,026 | 844,475,220 | 615,177 | 81,331,345 | 476,600 | 91,914,460 | 2,178,333,216 |

[1] Includes recoverable metal content of gravel, washed (placer operations); ore milled; old tailing or slimes re-treated; and ore, old tailing, and slag shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-grader," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] From 1904 when first satisfactory annual canvass of mine production was made to 1956, inclusive.
[5] Data not available.

Digitized by Google

Most of the remaining production came from: The Bristol mine, Jack Rabbit district, Lincoln County; the Copper Canyon and Copper Basin mines, Battle Mountain district, Lander County; and the Marshall (Nevada-Bellvue) mine, Contact district, Elko County.

**Gold.**—The quantity of lode gold produced in 1956 increased approximately 9 percent over 1955, owing largely to byproduct recovery from the ores of Nevada's copper mines. The Goldacres open pit in the Bullion district (Lander County) was the only large, straight-gold-mining operation in Nevada during the year. There were 132 lode mines in 16 counties that contributed to the State gold produc-

**TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals**

| County | Mines producing[1] | | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|
| | Lode | Placer | Fine ounces | Value | Fine ounces | Value |
| Churchill | 3 | -- | 19 | $665 | 2,631 | $2,281 |
| Clark | 11 | -- | 74 | 2,590 | 23,586 | 21,347 |
| Douglas | (2) | -- | (3) | (3) | (3) | (3) |
| Elko | 10 | -- | 186 | 6,510 | 69,632 | 63,021 |
| Esmeralda | 4 | 1 | [4] 253 | [4] 8,855 | [4] 87,876 | [4] 79,533 |
| Eureka | 5 | 1 | 3,130 | 109,550 | 139,204 | 125,987 |
| Humboldt | 5 | -- | 134 | 4,690 | 5,454 | 4,936 |
| Lander | 16 | -- | 19,482 | 681,870 | 54,550 | 49,371 |
| Lincoln | 10 | -- | 1,447 | 50,645 | 388,886 | 351,961 |
| Lyon | 5 | (3) | [5] 1 | [5] 35 | [5] 182 | [5] 165 |
| Mineral | 6 | -- | 296 | 10,360 | 36,514 | 33,047 |
| Nye | 16 | (3) | [5] 461 | [5] 16,135 | [5] 28,228 | [5] 25,548 |
| Pershing | 6 | 3 | [4] 88 | [4] 3,080 | [4] 2,898 | [4] 2,622 |
| Storey | 1 | -- | (3) | (3) | (3) | (3) |
| Washoe | 3 | -- | 56 | 1,960 | 682 | 617 |
| White Pine | 28 | (3) | [5] 45,920 | [5] 1,607,200 | [5] 373,444 | [5] 337,986 |
| Undistributed [3] [6] | 3 | (3) | 1,099 | 38,465 | 6,706 | 6,068 |
| Total | 132 | 5 | 72,646 | 2,542,610 | 1,220,473 | 1,104,590 |

| County | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Pounds | Value | Pounds | Value | Pounds | Value | |
| Churchill | -- | -- | 54,400 | $8,541 | 700 | $96 | $11,683 |
| Clark | 29,000 | $12,325 | 5,926,100 | 930,398 | 3,238,300 | 443,647 | 1,410,307 |
| Douglas | -- | -- | -- | -- | -- | -- | (3) |
| Elko | 609,000 | 258,825 | 661,700 | 103,887 | 238,300 | 32,647 | 464,890 |
| Esmeralda | 5,000 | 2,125 | 18,100 | 2,842 | 3,400 | 466 | [4] 93,821 |
| Eureka | 168,800 | 71,740 | 1,977,000 | 310,389 | 281,200 | 38,524 | 656,190 |
| Humboldt | 204,300 | 86,828 | 1,600 | 251 | 6,600 | 904 | 97,609 |
| Lander | 928,900 | 394,783 | 33,500 | 5,259 | 2,800 | 384 | 1,131,667 |
| Lincoln | 1,074,600 | 456,705 | 3,800,000 | 596,600 | 11,104,500 | 1,521,317 | 2,977,228 |
| Lyon | 62,435,200 | 26,534,960 | 9,000 | 1,413 | 8,600 | 1,178 | [5] 26,537,751 |
| Mineral | 15,500 | 6,587 | 84,400 | 13,251 | 1,500 | 206 | 63,451 |
| Nye | 5,600 | 2,380 | 25,100 | 3,941 | 6,200 | 849 | [4] 43,853 |
| Pershing | 2,500 | 1,062 | 2,000 | 314 | 1,200 | 164 | [4] 7,242 |
| Storey | -- | -- | -- | -- | -- | -- | (3) |
| Washoe | 10,600 | 4,505 | 15,600 | 2,449 | 3,600 | 493 | 10,024 |
| White Pine | 100,276,200 | 42,617,385 | 157,800 | 24,774 | 79,100 | 10,837 | [4] 44,598,182 |
| Undistributed [3] [6] | 800 | 340 | 1,700 | 267 | -- | -- | 45,140 |
| Total | 165,766,000 | 70,450,550 | 12,768,000 | 2,004,576 | 14,976,000 | 2,051,712 | 78,154,038 |

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] From property not classified as a mine.
[3] Douglas County and Storey County lode combined with "Undistributed" to avoid disclosing individual company confidential data.
[4] Esmeralda County placer combined with Pershing County to avoid disclosing of individual company confidential data.
[5] Lyon County, Nye County, and White Pine County placer combined with "Undistributed" to avoid disclosing individual company confidential data.
[6] Exclusive of placer output, which is included with "Undistributed."

Digitized by Google

tion, chiefly as a byproduct from ores treated primarily for recovering other metals. The lead ores of Eureka County and the lead-zinc ores of Lincoln County yielded noteworthy quantities of gold.

Only 350 fine ounces of placer gold was recovered in 1956, chiefly because the Natomas Co. did not reactivate its dredging operation in Lander County. Small-scale hand operations in Lander County supplied about 35 percent of the total placer gold recovered; small quantities came from Esmeralda, Eureka, Pershing, and White Pine Counties.

Of the 5 placer mines active during the year, 3 used small-scale hand methods, 1 was a nonfloat washing plant, and 1 a drift mine.

**TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 6,298 | 106,938 | 7,127 | 425 | 466 |
| February | 3,849 | 71,549 | 5,312 | 336 | 423 |
| March | 4,796 | 64,280 | 6,694 | 348 | 664 |
| April | 7,376 | 70,011 | 7,971 | 419 | 574 |
| May | 7,117 | 76,530 | 7,905 | 522 | 657 |
| June | 6,104 | 93,280 | 6,718 | 459 | 676 |
| July | 5,868 | 106,650 | 6,446 | 661 | 656 |
| August | 6,805 | 120,800 | 7,137 | 701 | 687 |
| September | 6,289 | 123,713 | 6,761 | 577 | 529 |
| October | 6,135 | 135,451 | 7,130 | 677 | 624 |
| November | 5,609 | 129,615 | 6,871 | 768 | 704 |
| December | 6,398 | 121,656 | 6,811 | 491 | 828 |
| Total | 72,646 | 1,220,473 | 82,883 | 6,384 | 7,488 |

**TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals**

| Source | Number of mines[1] | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Lode ore: | | | | | | | |
| Dry gold | 33 | 147,420 | 19,130 | 8,129 | 2,000 | 600 | |
| Dry gold-silver | 12 | 6,514 | 1,002 | 54,513 | 178,000 | 1,000 | |
| Dry silver | 23 | 18,068 | 103 | 127,056 | 17,500 | 36,100 | 16,400 |
| Total | 68 | 172,002 | 20,235 | 189,698 | 197,500 | 37,700 | 16,400 |
| Copper | 65 | 12,014,339 | 47,471 | 612,372 | 165,416,400 | 413,900 | 362,300 |
| Copper-lead-zinc | 1 | 55 | 1 | 1,526 | 7,700 | 28,100 | 10,600 |
| Lead | 28 | 8,046 | 3,335 | 196,472 | 14,300 | 2,893,700 | 161,800 |
| Lead-zinc | 12 | 84,870 | 1,135 | 197,394 | 114,500 | 3,518,600 | 10,861,400 |
| Zinc | 4 | 9,784 | 1 | 22,245 | 15,400 | 480,300 | 3,535,600 |
| Total | 110 | 12,117,094 | 51,943 | 1,030,009 | 165,568,300 | 7,334,600 | 14,931,700 |
| Other "lode" material: | | | | | | | |
| Old tailings[2][3] | 4 | 56 | 47 | 109 | | | |
| Lead residue | 1 | 11,329 | 13 | 596 | 200 | 5,395,700 | 27,200 |
| Zinc residue | 1 | 3 | 58 | 7 | | | 700 |
| Total | 6 | 11,388 | 118 | 712 | 200 | 5,395,700 | 27,900 |
| Total "lode" material | 184 | 12,300,484 | 72,296 | 1,220,419 | 165,766,000 | 12,768,000 | 14,976,000 |
| Gravel (placer operations) | 5 | (4) | 350 | 54 | | | |
| Total, all sources | 189 | | 72,646 | 1,220,473 | 165,766,000 | 12,768,000 | 14,976,000 |

[1] Details will not necessarily add to totals because some mines produce more than 1 class of material.
[2] Metal recovered, by class of old tailing, as follows: Gold, 56 tons—35 ounces gold, 80 ounces silver.
[3] Includes material from mercury-retort residue and tungsten-mill cleanup.
[4] 11,817 cubic yards.



Digitized by Google

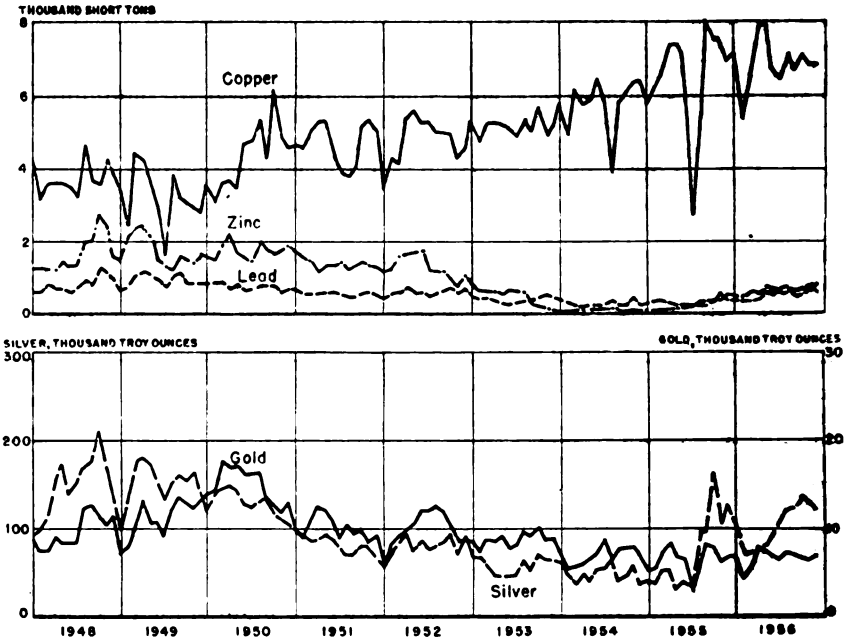



FIGURE 3.—Mine production of gold, silver, copper, lead, and zinc, in Nevada 1948–56, by months, in terms of recoverable metals.

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content**

| Class of material | Material shipped or treated (short tons) | Gross metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **CONCENTRATE SHIPPED TO SMELTERS** | | | | | | |
| Dry gold | 11 | 42 | 56 | 33 | | |
| Dry silver | 198 | 59 | 31,741 | 95 | 422 | 1,914 |
| Copper and copper precipitates [1] | 288,778 | 40,953 | 156,574 | 161,044,748 | 25,943 | |
| Lead | 3,433 | 649 | 113,843 | 37,666 | 2,968,067 | 280,778 |
| Zinc | 9,975 | 479 | 66,308 | 61,819 | 439,153 | 10,770,841 |
| Cement copper | 1 | | | 120 | 2 | |
| Total: 1956 | 302,396 | 42,182 | 368,522 | 161,144,481 | 3,453,587 | 11,053,533 |
| 1955 | 271,237 | 38,570 | 178,935 | 157,337,562 | 1,084,360 | 3,475,128 |
| **ORE, ETC., SHIPPED DIRECTLY TO SMELTERS** | | | | | | |
| Dry gold: | | | | | | |
| Crude ore | 109 | 313 | 260 | 2,036 | 929 | |
| Old tailings | 1 | 23 | 76 | 64 | 20 | |
| Dry gold-silver: Crude ore | 6,514 | 1,002 | 55,738 | 181,746 | 1,482 | 76 |
| Dry silver: Crude ore | 2,068 | 27 | 33,762 | 19,975 | 36,345 | 18,913 |
| Copper: Crude ore | 128,892 | 6,518 | 470,944 | 10,285,186 | 413,200 | 459,309 |
| Copper-lead-zinc: Crude ore | 55 | 1 | 1,526 | 9,024 | 28,581 | 13,475 |
| Lead: | | | | | | |
| Crude ore | 7,821 | 3,333 | 196,152 | 19,257 | 2,984,332 | 210,364 |
| Residue | 11,329 | 13 | 596 | 225 | 5,513,976 | 34,389 |
| Lead-zinc: Crude ore | 1,606 | 9 | 17,614 | 29,277 | 177,109 | 146,433 |
| Zinc: | | | | | | |
| Crude ore | 9,784 | 1 | 24,542 | 29,768 | 581,811 | 3,579,557 |
| Residue | 3 | 58 | 7 | | | 914 |
| Total: 1956 | 168,182 | 11,286 | 801,217 | 10,576,553 | 9,937,785 | 4,463,430 |
| 1955 | 182,925 | 7,162 | 305,007 | 4,283,180 | 5,721,070 | 2,861,601 |

[1] Combined to avoid disclosing individual company confidential data.

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals**

*A. For material treated at mills*

| | Material treated (short tons) | Recoverable in bullion | | Concentrate shipped to smelters [1] and recoverable metal | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Concentrate (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | | | | |
| Churchill | 45 | 7 | 27 | 1 | 2 | 112 | | 600 | |
| Clark | 53 | 1 | 1 | 17 | 34 | 81 | 100 | 1,100 | |
| Esmeralda | Cleanup | 17 | 62,276 | | | | | | |
| Humboldt | 300 | 6 | 4 | | | | | | |
| Lander | 146,340 | 17,698 | 1,110 | 1,692 | 709 | 17,831 | 277,800 | 14,300 | |
| Lincoln | 83,229 | | | 13,392 | 1,126 | 179,795 | 92,600 | 3,343,100 | 10,742,200 |
| Lyon | (2) | | | (2) | | | (2) | | |
| Mineral | 16,000 | | | 198 | 59 | 31,223 | | 400 | 1,500 |
| Nye | 408 | 145 | 70 | 8 | | 202 | | 7,000 | |
| Pershing | 17 | 19 | 16 | | | | | | |
| Washoe | 180 | 50 | 16 | | | | | | |
| White Pine | [3] 11,878,285 | | | [3] 287,086 | 40,244 | 133,193 | [3] 155,286,000 | | |
| Undistributed [4] | 7,445 | 873 | 6,602 | 2 | 8 | 17 | | 2,200 | 1,700 |
| Total: 1956 | 12,132,302 | 18,816 | 70,122 | 302,396 | 42,182 | 362,454 | 155,656,500 | 3,368,700 | 10,745,400 |
| 1955 | 10,627,412 | 20,121 | 365,829 | 271,237 | 38,870 | 175,305 | 153,642,100 | 1,092,500 | 3,376,100 |
| **BY CLASSES OF MATERIAL TREATED** | | | | | | | | | |
| Dry gold: | | | | | | | | | |
| Crude ore | 147,311 | 18,783 | 7,819 | 10 | 34 | 50 | | | |
| Old tailings [5] | 55 | 16 | 27 | 1 | 8 | 6 | | | |
| Dry silver: Crude ore | 16,000 | 17 | 62,276 | 198 | 59 | 31,223 | | 400 | 1,500 |
| Copper: Crude ore | 11,885,447 | | | 288,779 | 40,953 | 151,024 | 155,563,900 | 14,300 | |
| Lead: Crude ore | 225 | | | 11 | 2 | 337 | | 10,000 | |
| Lead-zinc: Crude ore | 83,264 | | | 13,397 | 1,126 | 179,814 | 92,600 | 3,344,000 | 10,743,900 |
| Total: 1956 | 12,132,302 | 18,816 | 70,122 | 302,396 | 42,182 | 362,454 | 155,656,500 | 3,368,700 | 10,745,400 |
| **BY CLASSES OF CONCENTATE SHIPPED TO SMELTERS [1]** | | | | | | | | | |
| Dry gold | | | | 11 | 42 | 56 | | | |
| Dry silver | | | | 198 | 59 | 31,223 | | 400 | 1,500 |
| Copper and copper precipitates [6] | | | | 288,778 | 40,953 | 151,024 | 155,563,800 | 14,300 | |
| Lead | | | | 3,433 | 649 | 113,843 | 32,000 | 2,936,800 | 221,700 |
| Zinc | | | | 9,975 | 479 | 66,308 | 60,600 | 417,200 | 10,522,200 |
| Cement copper | | | | 1 | | | 100 | | |
| Total: 1956 | | | | 302,396 | 42,182 | 362,454 | 155,656,500 | 3,368,700 | 10,745,400 |

See footnotes at end of table.

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued**

*B. For material shipped directly to smelters*

| | Material shipped (short tons) | Recoverable metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | |
| Churchill | 72 | 10 | 2,492 | | 53,800 | 700 |
| Clark | 20,994 | 39 | 23,504 | 28,900 | 5,924,100 | 3,236,600 |
| Elko | 17,651 | 186 | 69,632 | 609,000 | 661,700 | 238,300 |
| Esmeralda | 712 | 236 | 25,600 | 5,000 | 18,100 | 3,400 |
| Eureka | 6,737 | 3,064 | 139,199 | 168,800 | 1,977,000 | 281,200 |
| Humboldt | 5,343 | 128 | 5,450 | 204,300 | 1,600 | 6,600 |
| Lander | 17,586 | 1,075 | 35,609 | 651,100 | 19,200 | 2,800 |
| Lincoln | 11,562 | 321 | 209,091 | 982,000 | 456,900 | 362,300 |
| Lyon | (2) | (2) | (2) | (2) | (2) | (2) |
| Mineral | 911 | 237 | 5,291 | 15,500 | 84,000 | |
| Nye | 927 | 316 | 27,956 | 5,600 | 18,100 | 6,200 |
| Pershing | 47 | 1 | 2,871 | 2,500 | 2,000 | 1,200 |
| Washoe | 247 | 6 | 666 | 10,600 | 15,600 | 3,600 |
| White Pine | [3] 85,344 | [3] 5,677 | [3] 240,433 | [3] 7,425,400 | [3] 166,800 | [3] 87,700 |
| Undistributed | 49 | 2 | 49 | 800 | 400 | |
| Total: 1956 | 168,182 | 11,298 | 787,843 | 10,109,500 | 9,399,300 | 4,230,600 |
| 1955 | 132,925 | 7,154 | 303,380 | 4,207,900 | 5,519,500 | 1,963,900 |
| **BY CLASSES OF MATERIAL** | | | | | | |
| Dry gold: | | | | | | |
| Crude ore | 109 | 313 | 260 | 2,000 | 600 | |
| Old tailings | 1 | 23 | 76 | | | |
| Dry gold-silver: Crude ore | 6,514 | 1,002 | 54,513 | 178,000 | 1,000 | |
| Dry silver: Crude ore | 2,068 | 27 | 33,557 | 17,500 | 35,700 | 14,900 |
| Copper: Crude ore | 128,892 | 6,518 | 461,348 | 9,852,500 | 399,600 | 362,300 |
| Copper-lead-zinc: Crude ore | 55 | 1 | 1,526 | 7,700 | 28,100 | 10,600 |
| Lead: | | | | | | |
| Crude ore | 7,821 | 3,333 | 196,135 | 14,300 | 2,883,700 | 161,800 |
| Residue | 11,329 | 13 | 596 | 200 | 5,395,700 | 27,200 |
| Lead-zinc: Crude ore | 1,606 | 9 | 17,580 | 21,900 | 174,600 | 117,500 |
| Zinc: | | | | | | |
| Crude ore | 9,784 | 1 | 22,245 | 15,400 | 480,300 | 3,535,600 |
| Residue | 3 | 58 | 7 | | | 700 |
| Total: 1956 | 168,182 | 11,298 | 787,843 | 10,109,500 | 9,399,300 | 4,230,600 |

[1] Excludes concentrate treated only by amalgamation and/or cyanidation.
[2] Lyon County combined with White Pine County to avoid disclosing of individual company confidential data.
[3] Includes Douglas County, Storey County, and counties indicated by footnote 2.
[4] Includes material from tungsten mill cleanup and secondary mercury.
[5] Combined to avoid disclosing individual company confidential data.

**TABLE 11.—Gold and silver produced at placer mines, 1947–51 (average) and 1952–56, in fine ounces, in terms of recoverable metals**

| Year | Material handled (cubic yards) | Gold (fine ounces) | Silver (fine ounces) | Total value | Average gold value per cubic yard |
|---|---|---|---|---|---|
| 1947–51 (average) | 2,927,988 | 18,002 | 5,939 | $635,431 | $0.244 |
| 1952 | 5,625,620 | 33,079 | 11,011 | 1,167,730 | .206 |
| 1953 | 2,670,110 | 16,310 | 2,412 | 573,033 | .214 |
| 1954 | 3,014,130 | 17,246 | 2,475 | 605,850 | .200 |
| 1955 | 685,802 | 6,768 | 883 | 237,679 | .345 |
| 1956 | 11,817 | 350 | 54 | 12,299 | .895 |

Digitized by Google

**TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed in terms of recoverable metals**

| Type of material processed, and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Amalgamation and cyanidation: | | | | | |
| Ore | 18,800 | 70,095 | | | |
| Old tailings | 12 | 4 | | | |
| Mercury-retort residue | 4 | 23 | | | |
| Total recoverable in bullion | 18,816 | 70,122 | | | |
| Concentration and smelting of concentrates: | | | | | |
| Ore [1] | 42,182 | 362,454 | 155,656,500 | 3,368,700 | 10,745,400 |
| Direct smelting: | | | | | |
| Ore | 11,204 | 787,164 | 10,109,300 | 4,003,600 | 4,202,700 |
| Old tailings | 23 | 76 | | | |
| Lead residue | 13 | 596 | 200 | 5,395,700 | 27,200 |
| Zinc residue | 58 | 7 | | | 700 |
| Total | 11,298 | 787,843 | 10,109,500 | 9,399,300 | 4,230,600 |
| Placer | 350 | 54 | | | |
| Grand total | 72,646 | 1,220,473 | 165,766,000 | 12,768,000 | 14,976,000 |

[1] Includes concentrate from tungsten-mill cleanup.

**Iron Ore.**—Nevada's 1956 iron-ore production increased 120 percent over the preceding year, and shipments rose nearly 200 percent. Stocks of ore on hand at the beginning of the year were almost depleted. Seven companies operated open pit mines in 6 counties and produced nearly 900,000 tons of iron ore which averaged more than 58 percent iron. The increased production was due to the greater demand for high-grade ore in Japan, although important tonnages were shipped to eastern furnaces and California steel plants. Less than 1 percent of the Nevada iron-ore output was home-consumed in preparing dead-burned magnesia. One company, with open-pit operations in the Pinenut Mountains (Douglas County) and the Paradise Range (Nye County), produced approximately half of the State's iron ore in 1956. Mines in Pershing, Churchill, Eureka, and Humboldt Counties supplied the remainder.

**Iron and Steel Scrap.**—Several thousand tons of ferrous scrap, in the form of shredded detinned cans, were shipped to cement-copper producers in Lyon and White Pine Counties from the San Francisco and Los Angeles areas of California. Approximately equal tonnages of iron and steel scrap were shipped to California scrap dealers and brokers during the year. The principal sources of Nevada scrap were the several military bases in the State. Reno (Washoe County) and Las Vegas (Clark County) each had 3 collecting agencies, Winnemucca (Humboldt County) had 1.

**Lead.**—The quantity of lead produced in 1956 was more than 90 percent above that in 1955 and the highest since 1952. The increase resulted from the higher average unit price for the metal throughout the year. Clark County continued to be Nevada's leading producer, largely from lead residue derived from the treatment of manganese ores mined in the Las Vegas district. Lincoln County production was highlighted by the increased activity of Combined Metals Reduc-

Digitized by Google

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals [1]**

| County and district | Mines producing [2] | | Lode material (short tons) | Gold (fine ounces) | | | Silver lode and placer [3] (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Lode | Placer | Total | | | | | |
| Churchill County: East Gate | 1 | | 35 | 6 | | 6 | 26 | | | | $234 |
| Clark County: | | | | | | | | | | | |
| Gold Butte | 2 | | 97 | 3 | | 3 | 11 | 4,000 | | | 1,815 |
| Goodsprings (Yellow Pine) | 4 | | 9,562 | 1 | | 1 | 22,807 | 24,600 | 527,600 | 3,205,700 | 553,145 |
| Las Vegas | 1 | | 11,329 | 13 | | 13 | 596 | 200 | 5,395,700 | 27,200 | 851,931 |
| Elko County: | | | | | | | | | | | |
| Delano | 1 | | 2,406 | 13 | | 13 | 44,387 | 5,000 | 522,200 | 153,800 | 145,809 |
| Railroad (Bullion) | 1 | | 1,368 | 7 | | 7 | 13,020 | 20,300 | 124,300 | 82,100 | 52,234 |
| Esmeralda County: | | | | | | | | | | | |
| Hornsilver | | (4) | | | 16 | 16 | 5 | | | | 564 |
| Railroad Springs | (4) | | 30 | | | | | 4,800 | | | 2,040 |
| Silver Peak | 1 | | 539 | 17 | | 17 | 87,160 | | | 1,400 | 79,671 |
| Eureka County: | | | | | | | | | | | |
| Lone Mountain | 1 | | 376 | | | | 427 | | 11,200 | 281,200 | 40,668 |
| Lynn | | 1 | | | 66 | 66 | 5 | | | | 2,315 |
| Maggie Creek | 1 | | 2,242 | 14 | | 14 | 462 | 162,400 | | | 69,928 |
| Humboldt County: Awakening | 1 | | 300 | 6 | | 6 | 4 | | | | 214 |
| Lander County: Battle Mountain | 10 | | 24,704 | 1,762 | | 1,762 | 53,084 | 925,700 | 33,500 | 2,800 | 508,780 |
| Lincoln County: | | | | | | | | | | | |
| Groom | 1 | | 156 | 1 | | 1 | 764 | 400 | 66,300 | | 11,305 |
| Pioche | 5 | | 83,310 | 1,128 | | 1,128 | 180,347 | 92,600 | 3,344,500 | 10,742,200 | 2,238,827 |
| Lyon County: | | | | | | | | | | | |
| Pine Grove | 1 | | 19 | | | | 8 | 100 | | | 50 |
| Wellington | 1 | | 95 | 1 | | 1 | 154 | 1,400 | 9,000 | 8,600 | 3,361 |
| Yerington | 2 | (4) | 4,381,507 | | (5) | (5) | [6] 20 | 62,432,100 | | | [6] 26,533,660 |
| Mineral County: Acme | 1 | | 2 | | | | 3 | 400 | | | 173 |
| Nye County: | | | | | | | | | | | |
| Bellehelen | 1 | | 15 | | | | 1 | 700 | | | 298 |
| San Antone | 1 | | 96 | 1 | | 1 | 872 | 1,200 | 8,300 | 700 | 2,733 |
| Tonopah | 1 | | 650 | 290 | | 290 | 25,909 | | | | 33,599 |
| Twin River (Millett) | 1 | | 13 | | | | 63 | | 4,300 | 5,000 | 1,417 |
| Union | 1 | | 24 | | | | 60 | 2,500 | | | 1,117 |

Digitized by Google

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pershing County: Willow Creek | | 1 | | | 18 | 18 | 3 | | | | 633 |
| Washoe County: Peavine | 1 | | 43 | 5 | | 5 | 207 | 6,500 | | | 3,124 |
| White Pine County: | | | | | | | | | | | |
| Cherry Creek | 3 | | 12 | 2 | | 2 | 73 | | | | 126 |
| Duck Creek | 2 | | 2 | | | | 3 | 999 | | | 144 |
| Robinson | 14 | | 7,881,532 | 45,911 | | 45,911 | 364,781 | 100,260,160 | 220 | 59,100 | 44,555,655 |
| Ward | 1 | | 60 | 3 | | 3 | 1,643 | 1,500 | 16,220 | | 4,900 |
| White Pine | 5 | | 259 | 3 | | 3 | 3,740 | 12,160 | 135,700 | 20,000 | 33,148 |
| Undistributed [7] | 66 | 3 | 199,701 | 23,109 | 250 | 23,359 | 415,978 | 1,807,100 | 2,565,100 | 386,200 | 2,420,410 |
| Total Nevada | 122 | 5 | 12,300,484 | 72,296 | 350 | 72,646 | 1,220,473 | 165,766,000 | 12,768,000 | 14,976,000 | 78,154,036 |

[1] Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts are listed in footnote and their output grouped as "Undistributed."

[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

[3] Source of silver as follows: 1,220,419 ounces from lode mines and 54 ounces from placers.

[4] From property not classed as a mine.

[5] Included with "Undistributed" to avoid disclosing individual company confidential data.

[6] Exclusive of placer output which is included with "Undistributed."

[7] Includes the following: Chalk Mountain, Holy Cross, and West Gate in Churchill County; Charleston Mountain, Eldorado Canyon, Gass Peak, and Searchlight in Clark County; Gardnerville in Douglas County; Contact, Dolly Varden, Island Mountain, Loray, Mud Springs, and Ruby Range in Elko County; Goldfield, Klondyke, and Lida in Esmeralda County; Eureka and Newark in Eureka County; Battle Mountain, Golconda, National, Potosi, and Varyville in Humboldt County; Aspen, Beowawe, Birch Creek, Bullion, and Spencer's Hot Springs in Lander County; Atlanta, Ferguson, and Jack Rabbit in Lincoln County; Candelaria, Santa Fe, and Silver Star in Mineral County; Bruner, Clifford, Jackson, Lodi (Mammoth), Manhattan, Morey, Quartz Mountain, and Reveille in Nye County; Humboldt, Rabbit Hole, Scossa, Seven Troughs, Sierra (Sunshine), Star, Table Mountain, and, Unionville (Buena Vista) in Pershing County, Comstock in Storey County; Galena Olinghouse (White Horse), and Pyramid in Washoe County; Aurum, Bald Mountain (Ruby Mountain), Newark, and Osceola in White Pine County, and counties indicated by footnotes 5 and 6.

Digitized by Google

tion Co. in the Pioche district, and of Bristol Silver Mines Co. in the Jack Rabbit district. Eureka County had an important lead output from the mines in the Eureka and Lone Mountain districts. Production from the Bullion and Delano districts (Elko County) was noteworthy. The remaining output was derived from various small mines in 10 counties, the largest contribution was from White Pine County.

**Manganese.**—Outputs of manganese ore, nodules, electrolytic manganese dioxide, and low-grade manganese ore were considerably greater in 1956 than in the preceding year, principally from deposits in Clark, Lincoln, and White Pine Counties. Two operators in White Pine County and one in Lincoln County shipped ore to the GSA government Butte (Mont.) Purchase Depot. The Lincoln County operator also shipped ore to a Government stockpile under the carlot program and sold low-grade material to a Clark County plant that produced electrolytic battery-active manganese dioxide. This plant also received manganese ores mined in Montana and Mexico. The product was utilized as a depolarizer in dry batteries, including heavy-duty cold weather and hot-weather military batteries. Nevada's leading individual producer mined ore at its Clark County open pit in the hills bordering Lake Mead between the Muddy and El Dorado Ranges. The ore was concentrated at the company mill and the concentrate nodulized for shipment under DPA contract listed in table 4. White Pine County had two producers during the year, and both shipped to the GSA (Butte, Mont.) Purchase Depot. One of these operators mined by underground methods at the upper end of Robinson Canyon south of Ely, Nev., and shipped ore that averaged 42 percent Mn. The other operated open-pit and underground mines near Ruth, Robinson district, and shipped low-grade ore to a Government purchase depot. The only contract under DMEA terminated during the year, and there was no new activity in exploration and development of manganese deposits.

**TABLE 14.—Mercury production by methods of recovery**

| Year | Direct furnaced | | Retorted | | Unclassified; [1] 76-pound flasks | Total | | Operating mines |
|---|---|---|---|---|---|---|---|---|
| | Ore (short tons) | 76-pound flasks | Ore (short tons) | 76-pound flasks | | 76-pound flasks | Value [2] | |
| 1947-51 (average) | 12,770 | 2,250 | 168 | 16 | 1 | 2,267 | $219,606 | 6 |
| 1952 | 81,921 | 11,444 | 2,248 | 305 | 2 | 3,823 | 701,429 | 9 |
| 1953 | | | | | | 3,254 | 628,120 | 12 |
| 1954 | | | | | | 4,974 | 1,315,076 | 21 |
| 1955 | 73,538 | 10,763 | 5,882 | 834 | 12 | 5,750 | 1,669,512 | 33 |
| 1956 | | | | | | 5,859 | 1,522,871 | 51 |

[1] Includes mercury recovered from miscellaneous dump material.
[2] Value calculated at average price at New York.

**Mercury.**—Nevada's mercury production increased in 1956. Shipments were only slightly above production; thus stocks were not affected appreciably. Although 8 counties contributed to Nevada's total production, Humboldt and Pershing furnished over 97 percent of the output, and credit for most of the yield went to the Cordero Mining Co. Cordero mine near McDermitt (Humboldt County), the

Digitized by Google

Nation's largest individual producer. Only 6 operators produced over 50 flasks each during the year, although there were 55 producers at 51 operations—an increase of more than 50 percent over 1955. Despite the interest in this commodity, there was only one mercury-ore exploration contract in effect under DMEA and this was continued from the previous year. Activity in construction and assessment work was carried on at mercury properties in Esmeralda and Mineral Counties but no production was reported.

**Molybdenum.**—All of Nevada's molybdenum production was as a byproduct molybdenite concentrate from the McGill copper concentrator in White Pine County. Recovery was from the copper-porphyry ores mined in the Robinson district by the two major copper companies operating in that area. The entire molybdenite production was sold outside the State. The output was greater than in 1955 as a result of the increased tonnage of copper ore mined and treated at the concentrator. Also the molybdenum content of the ore mined was slightly higher than in 1955.

**Silver.**—The total quantity of silver recovered increased nearly 45 percent over 1955 and was derived primarily as a byproduct of copper-, lead-, and zinc-mining throughout the State. Sixteen counties contributed to Nevada's total silver yield, but most was from the lead-zinc ores mined by the Combined Metals Reduction Co. in the Pioche district and the copper ore mined by Bristol Silver Mines Co. in the Jack Rabbit district (Lincoln County). Important quantities of silver were recovered from the porphyry-copper ores of the Robinson district (White Pine County), and the lead ores of the Eureka district (Eureka County). Esmeralda County dropped to fourth position in Nevada silver output because the Mohawk mine and Bruhi mill, which worked straight silver ore, were not reactivated under new management until the latter half of the year. Smaller quantities of silver were recovered from lead ores mined in Elko County, oxidized zinc ores that had been stockpiled at Jean, lead-zinc ore mined in the Goodsprings district, and lead residue from treated manganese ores of the Henderson area—all in Clark County. The quantity of silver produced as a coproduct of gold at placer mines was insignificant.

**Titanium.**—Titanium Metals Corp. of America was the Nation's leading producer of titanium metal in 1956 at its plant at Henderson, Clark County. During the year, TMCA obtained a 15-year lease on the Henderson-plant property of Pioche Manganese Co., which included water, power, and utility rights, in addition to a 75-acre area. The company announced plans that would expand the sponge-metal production 50 percent and titanium-ingot output nearly 100 percent in 1957. TMCA announced two reductions in the prices of its mill products in 1956, attributed to cost improvements achieved by volume production and technological advances, particularly in vacuum melting, utilization of scrap, and continuous rolling of sheet and strip. In December 1956 over 700 people were employed at TMCA's Henderson facilities. Rutile consumed at the plant was from other States and foreign sources.

In September the Bureau of Mines Electrometallurgical Experiment Station at Boulder City completed a contract with Wah Chang Corp. on development of an improved Kroll process for producing

Digitized by Google

titanium-sponge metal. Research at Boulder City continued, under a Bureau agreement with GSA, to develop processes for producing titanium tetrachloride from abundant titanium-bearing material, including slag. The Bureau also had a contract with GSA to analyze all titanium sponge submitted by producers to determine whether or not the metal met Government purchase specifications.

**Tungsten.**—Nevada mines furnished over one-third of the Nation's tungsten-concentrate production in 1956. Shipments (in short-ton units of $WO_3$) were 12 percent below those in 1955, with less than 1

**TABLE 15A.—Tungsten concentrate produced from ores in 1956, by counties**

| County | Producing mines and prospects | Ore [1] | | | Concentrate produced [1] (pounds) | Contained $WO_3$ [1] units |
|---|---|---|---|---|---|---|
| | | Mined (short tons) | To mills (short tons) | Milled [2] (short tons) | | |
| Churchill | 12 | 1,507 | 1,507 | 1,531 | 19,187 | 613 |
| Clark | 1 | (3) | (3) | (3) | (3) | (3) |
| Douglas | 13 | 510 | 510 | [4] 2,373 | [4] 43,976 | [4] 1,411 |
| Elko | 7 | 2,176 | 2,176 | 777 | 8,248 | 272 |
| Esmeralda | 3 | 347 | 347 | 347 | 2,908 | 98 |
| Humboldt | 7 | 290,550 | 290,550 | 292,584 | 3,703,610 | 125,107 |
| Lander | 4 | 13,256 | 13,256 | 13,239 | 149,612 | 4,998 |
| Lincoln | 1 | (3) | (3) | (3) | (3) | (3) |
| Lyon | 3 | 152 | 152 | 126 | 1,920 | 60 |
| Mineral | 19 | 79,410 | [5] 79,410 | [5] 76,393 | 1,344,862 | 42,060 |
| Nye | 27 | 23,134 | 23,161 | 25,879 | 720,379 | 22,431 |
| Pershing | 28 | 230,204 | [5] 230,436 | [5] 229,545 | 2,008,940 | 71,031 |
| White Pine | 14 | 15,639 | 15,639 | 14,607 | 180,567 | 6,000 |
| Undistributed | ---------- | 260,309 | 252,038 | 251,908 | 1,722,509 | 53,755 |
| Total | 139 | 917,194 | 909,182 | 909,309 | 9,906,718 | 327,836 |

**TABLE 15B.—Production and shipments of tungsten concentrate in 1956 credited to Nevada counties in which ore was mined**

| County | Concentrate | | | | |
|---|---|---|---|---|---|
| | Produced [1] | | Shipped | | |
| | Pounds | Units | Pounds | Contained $WO_3$ units | Value [6] |
| Churchill | 19,064 | 610 | 19,064 | 610 | 36,897 |
| Douglas | 5,927 | 190 | 5,927 | 196 | 11,952 |
| Elko | 45,101 | 1,434 | 45,101 | 1,434 | 80,743 |
| Esmeralda | 2,908 | 98 | 2,908 | 98 | 6,165 |
| Humboldt | 3,656,142 | 123,606 | 3,488,142 | 118,163 | 7,069,330 |
| Lander | 149,850 | 5,006 | 149,850 | 5,006 | 292,930 |
| Lyon | 2,190 | 69 | 2,190 | 69 | 3,898 |
| Mineral | 1,387,466 | 43,380 | 1,392,062 | 45,116 | 2,725,333 |
| Nye | 681,394 | 21,232 | 710,594 | 22,105 | 1,352,276 |
| Pershing | 2,023,837 | 71,504 | 1,874,570 | 66,595 | 3,978,580 |
| White Pine | 192,307 | 6,368 | 193,856 | 6,420 | 374,665 |
| Undistributed [7] | 1,723,910 | 53,800 | 1,864,130 | 58,217 | 3,330,304 |
| Total | 9,890,096 | 327,303 | 9,748,394 | 324,029 | 19,263,193 |

[1] Partly estimated.
[2] Ore actually milled in county, including material from other counties and States.
[3] Included with "Undistributed" to avoid disclosing individual company confidential data.
[4] Includes material from California mines.
[5] Includes small quantities of tailing.
[6] Based on values reported by GSA, San Francisco, Calif.
[7] Includes Clark and Lincoln Counties.

Digitized by Google

percent of total production going to private industry. The number of producing mines declined 14 percent and reflected the closing of many borderline mining operations. Funds available for purchasing concentrate under the original purchase program by Government were exhausted in September 1956. Additional funds were available in October at a reduced unit price to the major producers, who greatly curtailed their operations by the end of the year. Five counties yielded over 95 percent of the State production, and 6 mines produced nearly 90 percent of the recovered tungsten concentrate. These were: The Riley and Getchell mines, Humboldt County; the Lincoln mine, Lincoln County; the Leonard mine, Mineral County; the Victory mine, Nye County; and the Tungsten mine, Pershing County. Activity in tungsten exploration under the DMEA program continued high; 12 projects were in effect in Nevada during the year.

**Uranium.**—Uranium activity continued to be high in 1956. Nine mining companies shipped ore to concentrators in Utah and Colorado during the year. Operations in the Reese River district (Lander County) and the Pyramid and Red Rock districts (Washoe County) produced more consistently. Available production figures for the first half of 1956 showed uranium-ore shipments by four operators, one each in Lander, Lincoln, Lyon, and Washoe Counties. The tonnage shipped to out-of-State processing plants during this period was substantially greater than the shipments in the latter half of 1955.

**Zinc.**—Renewed and expanded activity in the Pioche area of Lincoln County by Combined Metals Reduction Co., which shipped zinc concentrate, was the chief factor in the increased zinc production in Nevada in 1956. The increase was approximately 180 percent over 1955 and resulted from the favorable average unit price for the metal throughout the year. Shipments of oxidized zinc ore from the Government stockpile at Jean, Clark County, to a smelter-fuming plant added greatly to the State zinc production. This ore was mined before July 1944 from the Goodsprings (Yellow Pine) district in the same county. Some zinc production was obtained at smelter-fuming plants from the zinc and lead ores mined in the Lone Mountain district, Eureka County; Delano and Railroad districts, Elko County; White Pine district, White Pine County; Wellington district, Lyon County; and Golconda district, Humboldt County.

## NONMETALS

**Barite.**—In 1956 the production of crude and ground barite increased by 275 and 328 percent, respectively. The chief reason for this increase was the greater demand for the ground mineral for use in drilling mud in the Gulf States and on the west coast. Three counties contributed Nevada's entire production. Mineral County production, however, about equaled that mined during the preceding year. All crude barite produced in Elko County was shipped to grinding plants in California. Nevada's major producer, in Lander County, operated the State's only grinding plant and shipped ground barite to consumers on the west coast. This company consigned crushed material to its grinding plants in Louisiana and Texas. Another company operated two properties in Lander County and shipped crude ore to its plant in California for use in manufacturing barium chemicals.

Digitized by Google

**Brucite.**—The Gabbs area (Nye County) was the source of all brucite produced in Nevada in 1956. Basic, Inc., treated the mined mineral by heavy-medium separation. Except for small tonnage sold to California consumers, the upgraded product was shipped to the company plant in Ohio and used in manufacturing magnesia grain refractory for use in basic-steel furnace bottoms. The Standard Slag Co. mined a magnesite deposit containing brucite in the same area but did not separate the two minerals.

**Clays.**—Clay production during 1956 increased over 100 percent. The demand for fire clay and miscellaneous clay for use in heavy clay products increased appreciably. Las Vegas Brick & Tile Manufacturing Co., a new plant in 1956, mined an important tonnage of miscellaneous clay near Whitney (Clark County) for its own use. Reno Press Brick Co. (Washoe County) increased its production of both miscellaneous and fire clays owing to greater demand for its products. A small tonnage of fire clay was mined near Ely (White Pine County) and used at the furnaces of the McGill smelter, Kennecott Copper Corp. Industrial Minerals & Chemicals Co. produced a much higher tonnage of fuller's earth from Lyon County in 1956 than in the previous year. The material was shipped to the company plant in California and prepared for special pharmaceutical uses. L. R. Moretti mined small tonnages of bentonitic clay in Clark and Nye Counties, which were processed at a California plant for use as filler.

**Diatomite.**—Nevada production in 1956 was confined to one pit each in Churchill, Esmeralda, and Storey Counties. The total yield remained about equal to that in the preceding year, although the demand by paper, paint, and insecticide manufacturers had increased. This demand, in turn, caused a slight rise in the market value of the finished product per ton. Nearly all Nevada production was shipped to consumers outside the State.

**Fluorspar.**—Production of fluorspar in 1956 was only slightly above that in the preceding year. Most of Nevada's fluorspar production came from the Broken Hills area, Mineral County. The crude ore was treated at a flotation plant near Fallon (Churchill County), as was a small tonnage mined in Lander County. A few tons of tailing containing fluorspar from a tungsten operation in Lincoln County was also shipped to this flotation plant for treatment. The Acid-grade fluorspar recovered at the Fallon plant was shipped to a chemical plant in California, where it was converted to hydrofluoric acid and aluminum fluoride for use in the potlines of an aluminum producer in the Pacific Northwest. Several Nevada fluorspar deposits were approaching depletion at the year end. An operator in the Bare Mountains near Beatty (Nye County) mined nearly 5,000 tons of crude, Metallurgical-grade fluorspar and shipped the entire output to California steel plants.

**Gem Stones.**—Although a number of gem minerals (including agate, opal, and quartz crystals) were found in several Nevada counties, the principal production consisted of rhodonite, turquois, and obsidian. The rhodonite and some opalite were mined by a collector in Lander County. Important quantities of turquois were produced in Esmeralda, Lander, and Mineral Counties by various collectors. More than 1 ton of obsidian was obtained by three producers, most of it

Digitized by Google

came from Mineral County. One collector gathered several thousand pounds of petrified wood in Nevada during the year. Of special interest was the unconfirmed report that 200 pounds of howardite, a meteorite consisting of silicates of iron and magnesium, had been found in Esmeralda County by an Arizona collector.

**Gypsum.**—Gypsum production declined slightly in 1956 owing to lower demand caused by a decrease in small-home construction. In Clark County, Pabco Products, Inc., crushed gypsum at its White Eagle Pit near Henderson and shipped the product to a company-owned wallboard plant in southern California. The Blue Diamond Corp. calcined crude mineral from the Blue Diamond Pit; some of it was sold for use in industrial molding and in base-coat, perlite, and molding plasters. The company used the remaining calcined material in manufacturing gypsum lath and wallboard. Nevada Natural Gas Pipe Line Co. completed a pipeline to the calcining plant, and in May conversion was made from oil to gas firing. Blue Diamond Corp. also shipped crude gypsum to out-of-State cement plants for use as a retarder and sold a small tonnage for agricultural use. In Pershing County, United States Gypsum Co. mined gypsum at its Empire quarry and prepared the crude mineral at the company mill and calcining plant near the quarry in Washoe County. The calcined material was used for plaster and wallboard.

**Lime.**—The total lime production declined from the peak year 1955. Demand for the hydrated product remained substantially the same as in the preceding year, and the output was only a few hundred tons less. Most of the production was utilized by the building trades as a finishing lime and, except for a moderate tonnage used locally, was shipped to consumers outside the State. The decline in quicklime production during the year was due partly to increased substitution of magnesia and cement plasters for lime plasters and to decreased utilization in insecticides. Most of Nevada quicklime output was consigned to metallurgical plants in California; smaller tonnages were shipped to water-treatment and paper-pulp plants outside the State. All Nevada production was furnished by 2 operations in Clark County and 1 in White Pine. The latter's output met the requirements of the company-owned ore concentrator and smelter.

**Magnesite.**—Basic, Inc., and Standard Slag Co. worked deposits near Gabbs (Nye County) that were the source of all Nevada's magnesite in 1956. Except for a small tonnage of crude material sold by Basic, Inc., the magnesite mined by these companies was fired to produce caustic-calcined magnesia and refractory magnesia. The caustic-calcined product was utilized for manufacturing oxychloride and oxysulfate cements, in fertilizers, and in the treatment of metal ores. The refractory product was consumed in manufacturing refractory brick and shapes used principally by the metallurgical industry. A moderate quantity of the magnesia was shipped for export.

**Marl, Calcareous.**—Nevada's small production of calcareous marl was limited to the output of an open-pit operation in Washoe County in 1956. Both production and demand have remained about the same for the past several years. The raw material was shipped to California plants, where it was processed for use as a filler in poultry grits and livestock foods.

Digitized by Google

**Perlite.**—Crude-perlite production in Nevada in 1956, which was slightly lower than in 1955, was confined to Lincoln and Pershing Counties. Virtually all the Pershing County crude was expanded at the producer's mill in Washoe County; small tonnages were shipped to California and New York. The expanded material was used in manufacturing plasterboard. A Clark County processing plant used crude perlite from San Bernardino County, Calif., for plaster aggregate. The crude perlite mined in Lincoln County was shipped to out-of-State expansion plants. Production decline was due to the competition of substitutes for plaster. However, this was partly offset by increased use of the expanded perlite in plasterboard.

**Pumice and Volcanic Cinder.**—Only a token tonnage of pumice was quarried in Nevada in 1956. Pumice was produced in Churchill County and the material utilized as aggregate in the county. In Mineral County pumice was mined near Mina for use as concrete aggregate. Volcanic cinder was quarried near Lathrop Wells Junction (Nye County) and used as aggregate at a block plant near Las Vegas (Clark County). The Nevada Highway Department also quarried volcanic cinder in Nye County, using the material in surfacing roads and as an aggregate in building highway structures.

**Salt.**—One producer in Churchill County supplied all Nevada salt output in 1956. The salt was recovered by solar evaporation and surface-mining a dry lake bed. Output, considerably below that of 1955, was utilized locally in curing hides and feeding livestock.

**Sand and Gravel.**—An appreciably greater tonnage of sand and gravel was produced in Nevada in 1956 as compared with 1955. However, the value per ton decreased, because less tonnage was washed. A large quantity of paving sand, prepared by a contractor in Churchill County for the military forces, was used in constructing and maintaining airbase runways. In Lincoln County a contractor for the Union Pacific Railroad produced a large tonnage of sand and gravel for railroad ballast. The requirements of construction projects in the major centers of industrial activity, in Clark and Washoe Counties, made these areas the source of most sand and gravel production. Important road-construction projects in Elko, Lincoln, and Nye Counties increased the output in 1956. Storey County had no recorded sand and gravel production during the year. The Nevada Highway Department and contractors produced sand and gravel for highway use in the remaining 16 counties.

**Stone.**—The decline in stone production during 1956 was due to the completion (or near completion) of several major projects begun in 1955. The sharp drop in the output of crushed granite was directly related to completion of new water and sewage systems for Las Vegas (Clark County). The decreased output of crushed miscellaneous stone in Lincoln County was explained by near completion of a contract to supply the Union Pacific Railroad near Caliente with the material used for railroad ballast and riprap. The demand for crushed sandstone in Clark County for roofing granules dropped because of a decline in new home construction. The quantity of dimension stone produced for flagging in Clark, Humboldt, and White Pine Counties decreased for the same reason.

Digitized by Google

**TABLE 16.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Glass | (1) | (1) | (1) | (1) | (1) | (1) |
| Molding | 84,286 | $249,327 | $2.96 | 46,409 | $87,142 | $1.88 |
| Building | 288,899 | 332,456 | 1.15 | (1) | (1) | (1) |
| Paving | (1) | (1) | (1) | (1) | (1) | (1) |
| Engine | 600 | 250 | .42 | 115 | 200 | 1.74 |
| Other | (1) | (1) | (1) | 121,377 | 168,387 | 1.39 |
| Gravel: | | | | | | |
| Building | 293,134 | 363,151 | 1.24 | 226,004 | 312,264 | 1.38 |
| Paving | 757,805 | 651,010 | .86 | 709,761 | 415,846 | .59 |
| Railroad ballast | | | | (1) | (1) | (1) |
| Other | 68 | 50 | .74 | 51,016 | 103,040 | 2.02 |
| Undistributed sand and gravel | 298,005 | 939,810 | 3.15 | 595,787 | 912,334 | 1.53 |
| Total sand and gravel | 1,722,797 | 2,536,054 | 1.47 | 1,750,469 | 1,999,213 | 1.14 |
| GOVERNMENT-AND-CONTRACTOR OPERATION [2] | | | | | | |
| Sand: | | | | | | |
| Building | | | | 10,015 | 18,143 | 1.81 |
| Paving | 40,318 | 21,451 | .53 | 28,347 | 42,009 | 1.48 |
| Total | 40,318 | 21,451 | .53 | 38,362 | 60,152 | 1.57 |
| Gravel: | | | | | | |
| Building | 129,228 | 36,922 | .29 | 144,162 | 78,537 | .54 |
| Paving | 1,687,917 | 1,167,957 | .69 | 2,753,520 | 2,430,791 | .88 |
| Total | 1,817,145 | 1,204,879 | .66 | 2,897,682 | 2,509,328 | .87 |
| Total sand and gravel | 1,857,463 | 1,226,330 | .66 | 2,936,044 | 2,569,480 | .88 |
| ALL OPERATIONS | | | | | | |
| Sand | 712,108 | 1,543,294 | 2.17 | 731,841 | 1,217,814 | 1.66 |
| Gravel | 2,868,152 | 2,219,090 | .77 | 3,954,672 | 3,350,879 | .85 |
| Grand total | 3,580,260 | 3,762,384 | 1.05 | 4,686,513 | 4,568,693 | .97 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes figures for State, counties, municipalities, and other Government agencies.

**TABLE 17.—Stone, commercial and Government-and-contractor, sold or used by producers in 1955–56, by uses [1]**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Quantity | Value | Quantity | Value |
| Dimension stone: | | | | |
| Building stone: | | | | |
| Sawed stone and cut blocks.....cubic feet | 72,320 | $107,374 | 23,501 | $37,420 |
| Approximate equivalent in short tons | 6,149 | | 1,833 | |
| Flagging.....cubic feet | 9,410 | 14,930 | 11,487 | 20,025 |
| Approximate equivalent in short tons | 734 | | 896 | |
| Total dimension stone (quantities approximate, in short tons) | 6,883 | 122,304 | 2,729 | 57,445 |
| Crushed and broken stone.....short tons | 1,605,059 | 2,486,596 | 1,398,440 | 2,223,333 |
| Grand total (quantities approximate, in short tons) | 1,611,942 | 2,608,900 | 1,401,169 | 2,280,778 |

[1] Includes basalt, granite, limestone, marble, sandstone, and miscellaneous stone.

Digitized by Google

**Sulfur.**—Nevada's sulfur production in 1956 came from open pits in the low hills on the northwest slope of the Kamma Mountains (Humboldt County). Two companies mined ore at these pits during the year—approximately 6 months each. Production was more than five times the tonnage mined in 1955. The mined ore contained 25 to 35 percent sulfur. The material was crushed, bagged, and shipped to neighboring States for use as a soil aid. At the year's end, one company was constructing a plant at Sulphur, Nev., to house crushing and bagging equipment and permit increased shipments.

**Talc and Soapstone.**—The deposits in Esmeralda County were the source of all of the talc and soapstone in 1956. The one producer of soapstone was near Goldfield. Most of the talc output was from deposits near Dyer, worked by several operators. Total production declined in 1956 owing to decreased use as filler in insecticides, paint, and paper. An increased tonnage was sold for use as asphalt filler and in ceramics. The demand for most other uses remained about equal to that in 1955. Most of the Nevada production was shipped to grinding plants in California.

### MINERAL FUELS

Oil production in Nevada in 1956 was substantially the same as in 1955, all production being derived from the three Shell Oil Co. wells near Eagle Springs in the Railroad Valley, eastern Nye County. Six exploratory tests were drilled during the year, but all were dry. Extensive Federal acreage was surrendered by major and independent oil companies. Seismograph activity declined sharply with respect to 1955, but the number of gravimetric investigations increased. At the end of the year there was continued interest in the oil-production possibilities of the Ardon Dome area of Clark County and the Preston-Lund area of White Pine County.

There was no activity in 1956 on the proposed natural-gas pipeline between Mountain Home (Idaho) and the San Francisco Bay area of California. The proposal placed the pipeline through Reno (Washoe County).

## REVIEW BY COUNTIES

All 17 counties in Nevada contributed to its total mineral production; however, over 80 percent of the value came from 5 counties—namely, White Pine, Lyon, Clark, Humboldt, and Lincoln, in the order named. White Pine County led the State in the value of copper and gold production. Lyon County was second, due chiefly to its copper output. Clark County was third because of the quantity of manganese ore and lead produced and its output of nonmetallic minerals and commodities, chiefly gypsum, lime, sand and gravel, and stone. Humboldt County led all other counties in the number of flasks of mercury recovered and in the tonnage of tungsten concentrate produced. Lincoln County, which ranked fifth, supplied larger quantities of silver and zinc than any other county and contributed considerable copper, lead, manganese, and tungsten. Nye County continued to be the only source of Nevada's crude-petroleum production.

Digitized by Google

**TABLE 18.—Value of mineral production in Nevada, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Churchill | $558,508 | $592,885 | Iron ore, sand and gravel, diatomite, tungsten, lead, silver, pumice, mercury, salt, gold, zinc. |
| Clark | 15,212,172 | 15,761,421 | Manganese ore, lime, sand and gravel, gypsum, stone, lead, zinc, silver, copper, clays, tungsten, gold. |
| Douglas | 120,037 | 704,757 | Iron ore, sand and gravel, tungsten, stone, gold, silver. |
| Elko | 952,068 | 1,125,591 | Sand and gravel, copper, barite, lead, tungsten, silver, zinc, gold, stone, mercury. |
| Esmeralda | [1] 872,968 | 818,989 | Diatomite, talc and soapstone, silver, sand and gravel, gem stones, gold, tungsten, lead, copper, zinc. |
| Eureka | 761,609 | 1,158,119 | Lead, iron ore, sand and gravel, silver, gold, stone, copper, zinc, barite. |
| Humboldt | [2] 10,133,719 | 9,127,636 | Tungsten, mercury, iron ore, sand and gravel, copper, stone, sulfur ore, silver, gold, zinc, lead, gem stones. |
| Lander | [2] 2,301,104 | [2] 2,337,834 | Barite, gold, copper, tungsten, sand and gravel, silver, uranium, gem stones, mercury, lead, fluorspar, zinc. |
| Lincoln | [2] 5,440,890 | [2] [3] 7,196,573 | Tungsten, zinc, lead, copper, manganese ore, silver, perlite, sand and gravel, stone, gold, fluorspar, mercury, uranium, gem stones. |
| Lyon | 25,386,961 | [2] 26,574,890 | Copper, sand and gravel, clays, gold, tungsten, lead, zinc, silver, uranium. |
| Mineral | 4,051,082 | 3,520,881 | Tungsten, fluorspar, barite, silver, sand and gravel, stone, lead, gold, copper, zinc, gem stones, pumice. |
| Nye | 3,159,865 | 3,104,468 | Tungsten, magnesite, iron ore, sand and gravel, brucite, petroleum, fluorspar, volcanic cinder, silver, gold, mercury, clays, lead, copper, zinc. |
| Ormsby | 4,945 | 50,927 | Sand and gravel. |
| Pershing | 6,483,802 | 5,982,014 | Tungsten, gypsum, iron ore, mercury, sand and gravel, perlite, antimony, silver, gold, copper, lead, zinc. |
| Storey | 1,120,054 | 1,236,530 | Diatomite, gold, silver. |
| Washoe | 663,272 | [2] 830,853 | Sand and gravel, stone, marl, clays, copper, lead, gold, uranium, silver, zinc. |
| White Pine | [2] 35,967,091 | [2] 46,068,703 | Copper, gold, lime, stone, tungsten, silver, molybdenum, sand and gravel, manganese ore, lead, zinc, clays. |
| Undistributed [4] | 29,604 | 39,765 | |
| Total | [1] 113,219,751 | 126,232,836 | |

[1] Revised figure.
[2] Excludes value of manganese and low-grade manganese ores sold and blended at Government low-grade stockpiles for future beneficiation.
[3] Includes value of uranium shipments during period January through June, 1956.
[4] Includes gem stone, mercury, tungsten, gold, copper, lead, and silver not listed by countries as data are not available.

**Churchill.**—Iron ore was the leading mineral produced in Churchill County during 1956. The Minerals Materials Co. operated the Buena Vista open-pit mine in the Buena Vista district and shipped 85,457 long tons of magnetite averaging 58 percent iron. The ore was destined largely for export to Japan. Sand and gravel continued to be an important commodity in the county, and total output increased over 4 percent above that in 1955. George E. Miller prepared paving sand from deposits southeast of Fallon, using a portable plant. The United States Army Corps of Engineers and the Nevada Highway Department and its contractors produced sand and gravel for highway construction and repair at various localities in the county.

Diatomite was produced by the Aquafil Co. at its Chick Bed open-pit mine near Fallon. The material was transported to the company mill at Fernley in Lyon County for grinding and reshipped to chemical plants.

Tungsten-ore production in Churchill County dropped 47 percent from the previous year due to the closing of marginal operations and curtailment of the Government purchase program. Fifteen operators at 12 mines in the county produced ore during the year. The major yield came from the *Sand Springs* district southeast of Fallon. The



Digitized by Google

leading producers were: Churchill Tungsten Mining Co., Red Top and Red Ant mines group; G. Fisk and E. Reafs, Iron Man mine; and J. R. Young, Crystal mine. Only minor operations were conducted elsewhere. All ore was shipped to custom mills in adjacent counties of California except that of the Churchill Tungsten Mining Co., which operated its own mill at the mine site.

A small tonnage of lead ore was mined in the *Chalk Mountain* district at the Big Ben mine 16 miles west of Eastgate. This mine produced the only zinc in the county as a byproduct of lead-ore recovery. A smaller amount of lead ore was produced at the Camp Terrell group of claims in the *Holy Cross* district, 26 miles south of Fallon. The ore from these mines was also the source of most of the county output of recoverable silver and gold.

Pumice was produced by the Fallon Concrete Products Co. near Fallon for its own use as concrete aggregate, and none was sold commercially. A small quantity of mercury ore was mined and retorted at the Red Bird group of claims in Shoshone Canyon by Lloyd Shaw. The Leslie Salt Co. produced evaporated salt from the Fallon Development Co. dry-lake deposits near Fallon. The entire output was used locally.

**Clark.**—Clark County was again the leading producer of manganese ore in Nevada and the Nation. The chief source of the ore was the Three Kids mine of Manganese, Inc., 6 miles northeast of Henderson. The ore was treated at the company concentrating and nodulizing plant at Henderson and shipped under Government contract. The American Potash & Chemical Corp. produced synthetic Battery-grade manganese at its Henderson plant from ores purchased in Lincoln County and also from Arizona, Montana, and Mexico.

The United States Lime Products Corp. operated two plants in Clark County and was the State's largest lime producer. Its plant at Henderson, equipped with 4 rotary kilns and 1 continuous hydrator, had an annual capacity of 72,600 short tons. The plant produced lime products, largely for out-of-State steel, chemical, metallurgical, and construction industries. The other company plant at Sloan, which was equipped with 2 rotary kilns and 1 batch hydrator, has a rated annual capacity of 39,600 short tons. It supplied lime products to the previously mentioned industries and furnished dolomitic limestone both to the steel industry and to the Henderson plant for further processing.

Clark County was the foremost sand and gravel producer in Nevada and supplied over a third of the State total. In the Overton area glass sand was produced by Hunt Foods, Inc., and United States Silica Corp., and molding sand was prepared by Fred L. Morledge at the Red Gorge pit and the Moapa Placer claims and by Snoreen & Son at their Kaolin Wash pit.

Structural sand and gravel was produced by Atlas Ready Mix Concrete, Las Vegas Building Materials, Inc., Stocks Mill & Supply Co., and Gornowich Sand & Gravel Co., Well Cargo, Inc., Wells Stewart, and Gibbons & Reed Co. in the Las Vegas-Whitney area. Sand and gravel for roadwork was also produced by the city of Las Vegas, Clark County Engineering Department, Nevada Highway Department, United States Bureau of Public Roads, and the Lake Mead National Recreation Area at various localities throughout the county.

Digitized by Google

Production of crude and calcined gypsum was slightly below that in 1955. The Blue Diamond Corp. worked its open-pit and underground gypsum mine 28 miles southwest of Las Vegas. The company calcined gypsum and operated a plaster mill and gypsum lath and wallboard plant near the mine. Some crude gypsum was sold as cement retarder and for agricultural purposes. The company converted from oil- to gas-fired kilns in May 1956. Production over that needed for operating the Blue Diamond plant was shipped to plants in California. Paboo Products, Inc., mined gypsum at its White Eagle pit 8 miles north of Henderson and shipped the entire production to its wallboard plant at Southgate, Calif.

The overall production of stone in Clark County decreased 12 percent from 1955 owing primarily to a sharp drop in the output of crushed granite. This decline was attributed to completion of new water and sewage systems for the city of Las Vegas. Production of crushed sandstone for use as roofing granules decreased slightly owing to a lower demand in building materials; the same was true of dimensional stone produced for flagging.

The output of crushed limestone increased slightly from the preceding year. The United States Lime Products Corp. operated the Apex limestone quarry and crushing plant 18 miles southeast of Mesquite and its quarry at Sloan 18 miles south of Las Vegas, and produced crushed limestone for metallurgical flux, refractories, and lime. The Diamond Gold Mining Co., with quarries 7½ miles north of Goodsprings, produced roofing granules at the company mill at Jean, Nev. The city of Las Vegas, the Lake Mead National Recreation Area and its contractors, and the Nevada Highway Department contractors produced miscellaneous stone for fill, concrete, and road metal at numerous locations in the county.

The lead residue, obtained from treating manganese ores from the Three Kids mine by Manganese, Inc., near Henderson, continued to be the chief source of lead in the county. The residue also contained some gold, silver, copper, and zinc, which were recovered at a Utah smelter. Several thousand tons of oxidized zinc ore, previously mined in the *Goodsprings* (Yellow Pine) district and stockpiled at Jean by the Government, was treated at a Utah smelter in 1956. The material yielded most of the zinc and silver and noteworthy percentages of the lead and copper credited to the county. In the same district smaller tonnages of direct-smelting copper ore (shipped from the Copper Chief mine "dump" and the "99" mine) and lead and lead-zinc ores (from the Maiden Rock and Bell mines) contained modest quantities of recoverable copper, lead, zinc and silver.

Two cars of copper ore containing silver was produced from the Lakeside mine in the *Gold Butte* district. Test shipments of lead-zinc and zinc ores were made from the Charleston Mountain and Gass Peak areas and the *Eldorado Canyon* district. A few tons of direct smelting copper ore were shipped from the *Bunkerville* and *Eldorado Canyon* districts. The small gold output in the *Searchlight* district was from cleanup operations at various mills.

Some miscellaneous clay was mined by the Las Vegas Brick & Tile Manufacturing Co., a new operation in 1956, from the El Dorado pit near Las Vegas, for use in manufacturing heavy clay products.

Digitized by Google

A small quantity of tungsten concentrate was produced from the Silver Lead mine near Mesquite and sold to out-of-State buyers.

**Douglas.**—Iron ore had the highest total value of all minerals produced in the county in 1956. The Standard Slag Co. operated the Minnesota open-pit mine in the *Buckskin* district 14 miles northwest of Yerington, Nev., and shipped 275,788 long tons of magnetite averaging 58 percent iron. The ore was destined largely for export to Japan.

The Nevada Highway Department produced considerable tonnages of paving sand and gravel at various localities in the county for use in road construction and maintenance. Douglas County and its contractor also produced crushed granite for use in surfacing roads.

Tungsten-ore output dropped 85 percent from 1955, chiefly because several marginal properties could not be operated under prevailing conditions. Most of the tungsten in the county came from the *Pine Nut* district. The chief producer was the Metallurgical Development Co., which operated the Owl, Romona, Scheelite, Tungstate, and Cosmo mines. The company also operated a mill 12 miles southeast of Gardnerville, accepted ore for custom milling, and marketed all of the tungsten concentrates produced in the county. Several other operators produced tungsten ore in the county, but the outputs were minor, varying from 2 to 20 short-ton units of $WO_3$. A small quantity of gold and silver was obtained from a rod mill cleanup at the Metallurgical Development Co. mill.

**Elko.**—The value of sand and gravel produced in 1956 increased over 8 percent, but the tonnage decreased 15 percent. This higher value was attributed to local fluctuations in production costs and quality of the material produced. Gibbons & Reed Co. and Morrison-Knudsen Co., Inc., produced paving gravel near Carlin and Wells. Alden A. Dumas prepared a small tonnage of roofing granules from miscellaneous stone quarried at an open pit south of Wendover Junction. The Nevada Highway Department, Elko County, the cities of Elko and Wells, the town of Carlin, and the Federal Forest Service produced sand and gravel at various locations in the county for road construction and maintenance. Nevada Highway Department contractors also produced a small quantity of miscellaneous stone for fill in highway construction.

In the production of base-metal ores the county ranked fifth in copper and fourth in lead and zinc. Most of the copper-ore output, which yielded considerable byproduct silver, came from the Marshall (Nevada-Bellvue) mine and from various mine dumps in the *Contact* district. Other producers of copper ore, containing silver, in the same district, were the Boston and Clark mines. The Delno mine in the *Delano* district was the county's chief producer of lead, zinc, and silver, in addition to some copper and gold, from lead ore smelted. Direct-smelting lead-zinc ore from the Aladdin mine in the *Railroad* district 30 miles southwest of Elko, also yielded important quantities of lead, zinc, copper, silver, and gold.

Barite production in Elko County came principally from the Rossi mine of the Baroid Division, National Lead Co., near Dunphy. The mine stock at the end of the year was appreciably larger than in 1955. All shipments from company operations were made to its plants in Merced (Calif.) and Corpus Christi and Houston (Tex.). Other barite production was by Odis Graves (from his property near Carlin)

Digitized by Google

and by Jensen Bros. & Steele (from their property near Wells). Both producers shipped to brokers and grinders in the San Francisco Bay area.

Tungsten-ore output in Elko County decreased over 44 percent from 1955. Eight properties that produced in 1955 were not operated in 1956. This was due largely to the remoteness of custom mills from these relatively small tungsten deposits. The Ruby Valley area had the largest output, and the leading producers were George F. Ogilvie and Lowell Thompson, who worked the Star mine. Smaller yields of tungsten came from V. H. Madden's Coon Creek mine in the *Jarbridge* district and from George H. Stevens' New Chance mine in the same district. The Ruby Range, Kinsley, and Mountain City areas each contributed small quantities to the county total. Exploration for tungsten ore under a DMEA loan was continued at the Monarch mine in the Spruce Mountain area, 50 miles south of Wells, by John Boundy & Sons. The county mercury output was 1 flask, retorted by G. C. Staggs during exploration of his Horse Mountain claims 90 miles northeast of Tonopah.

**Esmeralda.**—Only three Nevada counties produced diatomite during the year; of these, Esmeralda County was first in total output. The Dicalite Division, Great Lakes Carbon Corp., worked its open-pit deposit near Basalt. The company maintained a plant for crushing, drying, and air separation at the pit site. Most of the diatomite was used for filler in paper, paint, and insecticides. The tonnage produced declined slightly, although the value per ton was above that in 1955 due to the demand for a higher quality product.

The active talc and soapstone deposits of the State during 1956 were in southwestern Esmeralda County near the California-Nevada border. Most of the talc output was mined in the Sylvania area southwest of Lida, where the leading producers were: Leonard Shellenbarger, who worked the Oversight and Crystal Butte mines; Sierra Talc & Clay Co., from the Oasis, Reed, Rose and Amelia mines; and Archie Brady, from the White King mine. H. W. Stewart operated the Hideout and Lone Springs mines and was the only soapstone producer. In the Palmetto area west of Lida the Grandview Mining Corp. Wellington mine produced talc, and R. L. Knight produced talc from the Sundown mine, which was leased from Huntley Industrial Minerals, Inc. The combined production of talc and soapstone was only slightly below that in 1955, and a high percentage of the output was shipped to California grinders.

Silver production from Esmeralda County ores dropped 75 percent from 1955, owing largely to suspended operations from January through June 1956 at the Mohawk mine and mill (in the Silver Peak area), formerly operated by Bruhi Mining Co. The mine was reopened under new management in July. The direct-smelting silver ore shipped contained some recoverable zinc, and silver bullion from the cyanide mill cleanup contained a few ounces of gold. The Florence mine in the *Goldfield* district, worked by H. Carlson and Charles Cecchini and formerly operated by Newmont Mining Corp., produced most of the gold credited to the county, plus some copper and silver, from gold fluxing ore shipped to a Nevada copper smelter.

The Nevada Highway Department prepared gravel for paving

Digitized by Google

from various localities in the county. The tonnage produced was over five times that in the previous year and at a slightly higher unit value.

R. J. Frank and James Klapper leased the Lone Mountain Turquoise mine in the *Lone Mountain* district, and produced high-grade turquoise. The material was prepared for commercial sale as gem stone at the American Gem Co. shop in Tonopah, Nev.

The county tungsten ores yielded only 98 short ton units of $WO_3$ in 1956, compared with 163 units in 1955. The largest producer was the Lutah Uranium & Oil Co., which operated the Black Horse mine near Basalt. Other producers of tungsten concentrate were: Wisdom and Mani, who worked the Bright Stars group of claims near Dyer; and Don Clair, who operated the Four Aces mine in the *Sylvania* district, where a DMEA tungsten-exploration project was continued. The concentrate was disposed of to ore buyers. Direct-smelting lead ore from the Thanksgiving mine in the *Klondyke* district and the Leadville Canyon mine near Dyer yielded some zinc, silver, and gold, in addition to the lead. Thirty tons of copper ore, containing 4,928 pounds of copper, from the Copper King mine dump, in the *Railroad Springs* district, was shipped to a smelter.

**Eureka.**—The county was third in the value of the lead, silver, gold, and zinc produced in the State and seventh in copper. The Consolidated Eureka (Diamond-Excelsior) mine of the Consolidated Eureka Mining Co. in the *Eureka* district was the leading producer of lead, silver, and gold in the county from direct-smelting lead ore. The Mountain View Extension mine, operated by John Cardinelli and Tony Frank in the Lone Mountain area, by virtue of oxidized zinc ore shipped to a Utah smelter-fuming plant produced the only zinc credited to the county, was the only other producer of lead, and ranked second in silver production. The principal copper output, along with some silver and gold, was from the direct-smelting copper ore shipped from the Copper King mine operated by the Copper King Co. in the *Maggie Creek* district. Copper and a small quantity of silver and gold were produced at smelters from copper ore mined by the Standard Copper Corp. from the Flossie D. and Gossan claims, in the *Newark* district 8 miles northeast of Eureka. Some gold and a minor quantity of the coproduct silver were recovered from the small-scale stream-gravel placer operation of V. C. Fraizer on his Bull Dog claims in the *Lynn* district near Leadville.

The Simplot Iron Mines, Inc., shipped over 74,000 tons of hematite ore to the west coast for export from its Modarelli open-pit mine in the Amarilla area 16 miles south of Palisade. Almost 54,000 tons came from stocks mined previously; the remainder was newly mined ore. Eureka County and the Nevada Highway Department produced over twice as much sand and gravel in 1956 as in 1955, for use in road construction and maintenance at various localities in the county. The unit value was almost twice that in 1955. Over 54,000 tons of miscellaneous stone was produced by Archie L. Till under contract with the Southern Pacific Railroad Co. for road ballast, by utilizing a portable crushing plant. The only barite quarried in the county came from the Russell & Nichols deposit near Beowawe. The product was shipped to a California grinding plant.

Digitized by Google

**Humboldt.**—Humboldt County again led the State in tungsten-concentrate production, yielding almost one-third of the total output in 1956. Compared with 1955 production dropped almost 8 percent, as 10 fewer tungsten properties were mined in 1956. The southeastern portion of the county, extending from the Osgood Mountains north of the Humboldt River to the Sonoma Range south of the Humboldt River, was the main source of this supply. The leading producers were the Getchell Mines, Inc., Getchell group of mines and the Union Carbide Nuclear Co. Riley mine, both in the *Potosi* district of the Osgood Mountains. The Getchell Mines, Inc., processed 203,000 tons of ore from its own properties, milled 77,500 tons of ore from the Riley mine under contract, and treated tungsten ores purchased from other producers in the area. The Getchell mill treated most of the county tungsten-ore production; a relatively small tonnage was purchased by ore buyers.

In the same general area, T. N. T., Inc., worked the Mountain Queen claims and continued tungsten-ore exploratory work under a DMEA contract. R. B. Spitzer operated the Valley View open-pit mine near Golconda. Tungsten ore from both properties was shipped to the Getchell mill for processing. In the north-central part of the county, 11 miles south of Denio, Vernon Cannon operated the Defense mine and shipped tungsten concentrate produced from ore treated at the Ashdown mill. Apollo Mines, Inc., conducted exploratory work for tungsten ore at the Saddle mine, 3 miles north of Sentinel Peak.

The *McDermitt* district in the northeastern portion of the county was the principal mercury-producing area in the county and State. The Cordero Mining Co., operator of the Cordero mine in this area, was the Nation's leading mercury producer. The ore from this mine was treated in the company reduction plant at the mine site, where it was crushed and passed through a 100-ton-per-day Herreschoff furnace.

A small quantity of mercury was also produced in the *National* district, 12 miles southeast of McDermitt, at the Buckskin Peak mine operated by the Paradise Quicksilver Co. The Cahill mine, in the Poverty Peak area of the *Paradise Valley* district, operated by the Belco Petroleum Co., produced mercury. The company also leased the Hapgood and Turillas mercury mines in the same area and did extensive exploration and development work on its holdings.

In the *Bottle Creek* district, 55 miles northwest of Winnemucca, mercury was produced by The Triangle Mines from the B & B prospect. This company was arranging a consolidation of the Blue Can, Niebuhr, Red Ore, White Peaks, and Birthday (Wootan) properties in the same district, with considerable development work involved.

Out of six counties in Nevada that produced iron ore, Humboldt County ranked fourth. This production, all from the *Jackson Creek* district north of Jungo, was almost 49 percent more in quantity and over 15 percent more in value than in 1955. The ore was magnetite and came mostly from the De Long (Iron King) open-pit mine operated by the A & B Mining Co. The other producer in the same area was the Humboldt Metals Co., which worked some open pits on the Black Jack and Red Bird groups of claims. The ore produced in the area was shipped to eastern furnaces.

Digitized by Google

The city of Winnemucca, the United States Forest Service, Humboldt County, and the Nevada Highway Department produced sand and gravel at various localities throughout the county for use in road construction and maintenance. The quantity used was 10 percent less than in 1955, but the value was 26 percent greater. Wegman Bros., contractors, quarried sandstone west of Denio. The stone was dressed and palleted at the Pacific Stone, Inc., mill near Winnemucca. Production in 1956 was only 22 percent that in 1955.

The Peterson sulfur pit (erroneously called the Vitallo mine after the brand name of its product), 2 miles east of Sulphur, was worked the first half of 1956 by its owners, Sulphur Products, Inc., and in the latter part by Nevada Soilaid, Inc. Six times more sulfur ore was produced in 1956 than in 1955. The entire output was put through the company crushing plant at Sulphur, graded to a product containing 25 to 35 percent sulfur, and shipped as a soil aid.

Most of the copper, silver, gold, zinc and lead production credited to the county in 1956 was from dump material shipped by H. B. Hullinger to a Utah smelter from various sites, including the Blue Hill mine, in the Golconda area. Some copper, silver, and gold were recovered from direct-smelting gold-silver and copper ores produced in the *Battle Mountain* district from the Morning Glory, Morning Star, and New Sunday mines. Zinc residue from milling operations at the Getchell Mine, Inc., mill in the *Potosi* district, treated at a smelter, yielded gold, copper, and silver. A few pounds of fire opal was obtained by G. Keith Hodson from the Rainbow Ridge mine in the Virgin Valley area.

**Lander.**—Lander County ranked first in statewide crude-barite production and yielded over 72 percent more than in 1955. The largest output in the county and State was by the Magnet Cove Barium Corp., which operated open pits at its Greystone group and adjacent claims about 37 miles southeast of Battle Mountain. The quarried material was crushed and ground at the company plant at Battle Mountain. Most of the production was shipped to the corporation plants on the gulf coast as an additive to drilling mud. Barium Products, Ltd., operated the Argenta, Bateman Canyon, and Mountain Springs open-pit mines south of Battle Mountain. Shipments were to the company-owned plant at Modesto, Calif.

Additional barite was produced in the Battle Mountain area by Paul R. Sloan, who worked the White Rock group of claims near Beowawe; Alfred Shelton, from the Second Chance open-pit mine; and Andrew J. Shelton from the Shelton Barite No. 1 open pit. The entire output from the minor producers was shipped to grinding mills in California.

Although gold production in the county decreased almost 28 percent below that in 1955, it still ranked second in State output. This decrease was due largely to discontinuance of placer-gold mining. All of the gold in Lander County was derived from lode mines, and most of it came from the *Bullion* and *Battle Mountain* districts. The principal producer was the Goldacres open-pit mine in the *Bullion* district, operated in conjunction with a cyanide plant by The London Extension Mining Co. Silver was a coproduct of this operation. Copper, gold, and gold-silver ores from mines and mine dumps in the *Battle Mountain* district were the source of over 99 percent of the

Digitized by Google

copper, 95 percent of the silver, all of the lead and zinc, and about 9 percent of the gold credited to the county in 1956. A large percentage of the gold, silver, copper, and lead production was from the Copper Canyon mine and the various Copper Basin claims worked by the Battle Mountain Copper Co. and numerous lessees. The Battle Mountain Copper Co. operated a mill and shipped copper concentrate to smelters, while most of the lessees shipped direct-smelting ore. The zinc was recovered from silver ore, from the Galena mine dump, shipped to a smelter fuming plant.

Production of tungsten concentrate in the county decreased 35 percent below 1955. The chief producer was the Linka mine and mill in the Big Smokey Valley area near Spencer Hot Springs, operated by Consolidated Uranium Mines, Inc. Gale G. Peer worked the Conquest mine in the same area. Production from other sources in the county was small, varying from 1 to 12 units of $WO_3$ each, for the entire year. The United States Forest Service, Lander County, and the Nevada Highway Department produced sand and gravel at various localities for road construction and maintenance. The total output was 13 times that of 1955. Gem-stone production decreased to one-third of the value of 1955 production. Clifford C. Zarley mined 4,000 pounds of rhodonite in the *Battle Mountain* district and 200 pounds of opalite in the *Ivanhoe* district used for semiprecious-stone settings. Turquois was mined in the *Cortez* district by Waddel and Ward and also in the *Battle Mountain* district by T. E. Sabin. The Apex Uranium, Inc., operated the Diamond and Early Day groups of claims in the Reese River area 3 miles south of Austin. Uranium ore was shipped to concentrating plants in Utah and Colorado during the year. All of the mercury produced in the county in 1956 came from the McCoy mine in the *Wild Horse* district 32 miles northwest of Austin. The property was operated by the United Mercury Corp. from January through May. Keller Bros. mined fluorspar at the Iowa mine 37 miles northeast of Austin and shipped the ore to the Kaiser Aluminum & Chemical Corp. flotation plant in Fallon for treatment. W. L. Peterson et al. explored for manganese under a DMEA contract at the Last Chance mine, 36 miles northwest of Austin.

**Lincoln.**—Although the production of tungsten concentrate was down 7 percent from 1955, this county again ranked third in output of that material. This was due to the efforts of the Wah Chang Mining Corp. at its Lincoln mine in the *Tem Piute* district, where exploratory work was also continued under the DMEA program. The Lincoln Mine Division of the corporation shipped tungsten-bearing material to the Salt Lake Tungsten Co. in Utah and to Union Carbide Nuclear Co. in California for chemical treatment. The corporation also consigned concentrate requiring further treatment to Wah Chang Corp. at Glen Cove, N. Y., and sold tungsten concentrate that met Government specifications to GSA. A 750-ton-per-day gravity and flotation mill was operated adjacent to the mine.

A small tonnage of fluorspar resulting from the mill processing of tungsten ore was shipped to the Kaiser Aluminum & Chemical Corp. flotation plant at Fallon (Churchill County) for testing to determine the possibility of processing to Acid-grade spar. Consolidated Uranium Mines, Inc., conducted exploratory work for tungsten ore

Digitized by Google

at the Schofield mine in the *Tem Piute* district, under a DMEA contract.

Lincoln was Nevada's leading county for producing recoverable zinc and silver, ranking second in lead and fourth in gold. Most of this output came from ore mined in the Bristol Mountain Range. The operation of Combined Metals Reduction Co. in the *Pioche* district was the principal source of zinc, lead, and gold in the county, as well as substantial quantities of silver and copper. The company mined the Pioche No. 1 and No. 2 ore bodies in its Caselton mine and the ore of Raymond-Combined Mines, Inc., under an agreement with the latter. The company also continued to explore for lead and zinc ore under two separate DMEA contracts. One of these was at its Black Prince mine, the other was a joint venture with Raymond-Combined Mines, Inc., which was conducted on the lower levels of the Caselton mine. The lead-zinc ores mined at all operations were treated at the company Caselton mill, and the recovered zinc and lead concentrates were shipped to smelters in Montana and Utah, respectively.

The Yuba Dike mine, in the same area, operated by Yuba Dike Mines, Inc. (John A. Hedman), produced lead-zinc ore containing silver and gold, which was shipped to a Utah smelter. Exploratory work under a DMEA contract was done by the company at this mine.

The Bristol mine of Bristol Silver Mines Co., in the *Jack Rabbit* district, 10 miles north of the *Pioche* district, was the county's leading producer of copper and silver, derived from direct-smelting ore which also contained substantial quantities of recoverable lead and zinc and some gold. The ore was treated at a Utah smelter-fuming plant. A DMEA exploratory project for copper, lead, and zinc was in progress at this mine during the year, under the direction of lessees.

The Comet mine, in the *Comet* district 9 miles southwest of Pioche was also explored for lead and zinc ore under a DMEA contract with Comet Mines, Inc.

Direct-smelting lead ore containing copper, silver, and gold was shipped to a Utah smelter by Dan Sheahan from the Groom mine in the *Groom* district. Silver and gold were recovered from mine-dump ore shipped from the *Atlanta* district to a Nevada copper smelter for use as a flux.

All of Lincoln County's manganese-ore output in 1956 was made by Combined Metals Reduction Co. and mined at the Southpaw mine near Hiko. Ore from this mine was consigned, both to an electrolytic manganese dioxide plant at Henderson, Nev., and to Government stockpiles.

Crude perlite was quarried by this company at the Hollinger property 17 miles northeast of Pioche and sized at the Caselton plant. The Delamar Perlite Co. produced perlite at its Mackie open pit near Delamar. All of Lincoln County's perlite production was shipped to out-of-State expanding plants.

Morrison-Knudsen Co., under contract with the Union Pacific Railroad Co., produced sand and gravel, and crushed miscellaneous stone near Caliente for use as railroad ballast. The city of Caliente and the Nevada Highway Department and its contractor, prepared nearly 147,000 tons of paving sand and gravel and produced over

Digitized by Google

1,500 tons of crushed miscellaneous stone for use in road construction and repair.

The Western Mercury & Uranium Corp. retorted a few flasks of mercury from ore mined in 1955 at the Andies property in the *Tem Piute* district. In May 1956 this property was leased to the Mullen-Buckley Uranium Corp. of Los Angeles, Calif. The latter conducted exploratory operations for the remainder of the year.

Lester E. Lee worked the White Cloud claim, 1½ miles northeast of Panaca and shipped a small tonnage of uranium ore to a concentrating plant in Utah. A small quantity of gemstone material, consisting of agate and blue quartz, was collected by G. E. Johnston near Alamo.

**Lyon.**—Lyon County was Nevada's second ranking copper producer principally due to The Anaconda Co. open-pit mining and acid-leaching operations in the *Yerington* district. Cement copper was produced and shipped to the company smelter at Anaconda, Mont. Copper ore, containing a small quantity of silver, from the Mason mine and various mine dumps in this district, was shipped to a Utah smelter.

The Jack Pot mine, in the *Wellington* district, was the chief source of silver and the sole producer of lead and zinc from lead-zinc ore, which was shipped to a California smelter-fuming plant. Gold recovered during a cleanup at a placer operation on the Adam-Rice claims by Apex Mining Co., in the *Yerington* district, was virtually the county's entire output of that metal in 1956.

The Carson Ready-Mix Concrete Co. prepared gravel for use as a concrete aggregate, near Dayton. The Nevada Highway Department and its contractors produced sand and gravel at various localities in the county for road construction and repair. The total tonnage of sand and gravel used in the county was about 75 percent less than in 1955, and the unit value was 25 percent higher. Fuller's earth was produced at the Jupiter mine north of Weeks by the Industrial Minerals & Chemical Co. and shipped to California for pharmaceutical use.

Tungsten production in Lyon County was about 30 percent less than that of 1955. Three mines were in operation northwest of Fort Churchill. The largest yield was from the Rainbow group of claims operated by Gene Bailey, with the Blue Star and Tungsten Flat mines, both operated by Jim Cushman, second and third. The low-grade tungsten concentrate produced at these mines was sold to ore buyers for further beneficiation. Baker-Hazard Mines, Inc., worked the River Road group of claims 37 miles southwest of Hawthorne and made a small shipment of uranium ore to a Utah concentrator.

**Mineral.**—The county was the fourth-ranking producer of tungsten concentrate in Nevada in 1956. Although more than 45,000 short-ton units of $WO_3$ were produced from ore mined in the county, this was 17 percent less than in 1955. Nevada Scheelite Corp., subsidiary of Kennametal, Inc., operated a mine and mill in the *Rawhide* district, was Mineral County's leading producer of tungsten concentrate, and was the State's fourth largest. The company also milled ores and purchased tungsten ores and concentrates from other producers. A DMEA exploration project was begun at this mine in June 1956.

The second largest yield of tungsten concentrate was recovered from ore mined by Minada Corp. at the Silver Dyke mine in the

Digitized by Google

*Silver Star* district 20 miles southwest of Mina. The company also operated a mill at Sodaville that beneficiated tungsten ores.

Other mines that produced tungsten ore were the Eagle Tungsten mine, in the *Sante Fe* district east of Luning; Cedar Chest mine, near Mina; the Lindsay and Gun Metal mines, in the *Pilot Mountains* district east of Mina, operated by Consolidated Uranium Mines of Nevada; the Old Gentry mine, near Hawthorne; and the Don Clair mine, in the *Rawhide* district.

The Kaiser Aluminum & Chemical Corp. mined fluorspar at the Kaiser mine in the *Broken Hills* district 22 miles northwest of Gabbs and floated the material in its plant at Fallon, Churchill County, to produce an Acid-grade fluorspar. James Grousl & Associates shipped some fluorspar from the Spardome mine near Gabbs, to the Kaiser mine at Fallon. Macco Corp. operated the Noquez Barium property near Basalt and shipped barite to its grinding plant at Rosamond, Calif.

Ores of the *Candelaria* district yielded most of the silver, gold, lead, and zinc credited to the county. The Argentum Mining Co. of Nevada was the principal producer of silver and the only producer of zinc in the county during 1956. The silver concentrate was produced from mine dump ore, including the Northern Belle mine, treated in the company 300-ton-per-day flotation plant at Columbus Marsh and was reduced at a California smelter-fuming plant and a Nevada copper smelter. The principal source of lead and gold credited to the county was the New Potosi mine in the same district, operated by G. A. Peterson & H. Hunter. The lead ore from this mine was shipped for direct smelting in California and Utah and contained considerable silver, in addition to a substantial quantity of recoverable antimony. The county's minor copper production was largely from direct smelting copper ore, which also contained silver and gold, shipped to Utah from the Hercules mine in the *Sante Fe* district.

Copper was also recovered at an Nevada copper smelter from copper ore, containing silver, mined at the Last Chance mine in the *Silver Star* district, and the Linda Vista mine in the *Acme* district 5 miles northeast of Thorne. George E. Miller quarried gravel near Hawthorne for paving purposes. The Nevada Highway Department produced gravel and miscellaneous stone for use in road construction and maintenance in the county. Sonora Marble Aggregates Co. quarried a few tons of marble southwest of Luning. The crushed product, called "Neva Chips," was sold for terrazzo. Several hundred pounds of obsidian of gemstone variety was collected by Clifford C. Zarley in the Fish Lake area and by Jay Wilson southwest of Basalt near Montgomery Pass. A few pounds of turquois was obtained by G. K. Hodson at different points in the county. C. W. Cooper quarried a small tonnage of pumice near Sodaville for use as concrete aggregate.

**Nye.**—Nye County mines produced tungsten ore which yielded over 22,000 short-ton units of $WO_3$, or about 23 percent less than in 1955. Although there were 27 tungsten operations compared with 42 during the preceding year, the county maintained its ranking as the fifth largest producer in the State. Most of the tungsten-ore output came from the *Lodi* district near Gabbs. The largest output in this area and in the county was from the Victory mine by the Gabbs

Digitized by Google

Exploration Co., which also operated a gravity and flotation mill near the mine-site.

Another important producer in the same area was the El Capitan mine, worked by the El Capitan Mining Co. Tungsten ore from this mine was concentrated by the Yaney Milling Co. at Gabbs.

Exploration and development work for tungsten ore under a DMEA contract with the El Capitan Mining Co. was begun on El Capitan's property early in 1955 and completed in 1956.

Otherpr oducers in the same area that mined an appreciable tonnage of tungsten ore were: The Hope mine (operated by J. H. Baxter) and the White Diamond mine (operated by G. E. Walter). There was also production of tungsten ore, which yielded from 2 to 39 short-ton units of $WO_3$ each, at the Terrell mine 52 miles northeast of Currant; the Oak Springs mine near Oak Springs Butte; and the Gant, Centipede, and Ophir group of claims and the New Moose mine in the Twin River area southwest of Millett. Exploration work for tungsten ore, under a DMEA contract, was begun in November at the Climax mine, in the Oak Spring Butte area by A. J. Wright.)

Magnesite and brucite was produced in Nevada by two operators from deposits 2 to 4 miles east of Gabbs. Basic, Inc., quarried magnesite and brucite from the Betty O'Neal pit and operated a rotary kiln at its plant near Gabbs. The product was used to make refractory magnesia and oxychloride and oxysulfate cements. The crude brucite was shipped, mostly to company-owned plants outside the State, for use in manufacturing "Basifrit." A small tonnage was consigned to California chemical plants. Standard Slag Co. quarried crude magnesite from its Greenstone Extension pit and operated a calcining plant near Gabbs. The company produced caustic-calcined and refractory magnesia. Most of the calcined product was shipped to west coast ports for export. Standard Slag Co. also quarried magnesite at the leased Iron Mountain (Phelps-Stokes) open pit, a few miles north of its magnesite property. A very small percentage of this iron ore was used locally in preparing dead-burned magnesia, but most of it was shipped for export.

The United States Forest Service, the United States Army Corps of Engineers, Nye County, and the Nevada Highway Department and its contractors prepared paving sand and gravel for use in road construction and repair. Pitts were at various localities in the county. The Nevada Highway Department quarried several thousand tons of volcanic cinder in the county for road surfacing and construction, and the Cind R Lite Co. quarried similar materials at the Cinder Cone pit near Lathrop-Wells Junction for use as concrete aggregate.

Nye County continued to be the only producer of crude petroleum in 1956. Shell Oil Co. had three producing wells in the Eagle Springs Unit. About 59,000 barrels of oil was pumped during the year. No additional drilling was undertaken in 1956, but the company continued its exploration program in the county concentrating on surface and subsurface surveys.

J. Irving Crowell, Jr., mined Metallurgical-grade fluorspar at the Daisy group 5 miles east of Beatty and made shipments to steel plants in California. Also, in the same area, L. R. Moretti quarried bentonite clay at the White Caps pit and made shipments to California for pharmaceutical use.

Digitized by Google

Ores containing 1 or more of the 5 metals gold, silver, copper, lead and zinc were mined in the county on a small scale. Except for 1 operator, who shipped 650 tons of silver ore, the total individual shipments of direct-smelting ores and tailings in this category from the other 21 operations in 13 districts ranged from 1 to 162 tons during the year. The Summit King (Tonopah King) mine at Tonopah, operated by Leonard Traynor, was the leading producer of gold and silver, which was recovered from gold-silver fluxing ore shipped to a Nevada copper smelter. The Florence mine (16 miles north of Tonopah in the *San Antone* district), operated by the Rainbow Uranium Co., was the principal lead producer from direct-smelting silver ore, which also contained recoverable copper, zinc, silver, and gold, treated at a Utah smelter-fuming plant.

The Copper King group of claims 5 miles south of Ione in the *Union* district and the Copper King No. 1 claim, in the *Bellehelen* district produced small tonnages of direct-smelting copper ore that contained some silver. The Black Jack mine, in the *Twin River* district, was the source of lead-zinc ore (containing silver) that was reduced at a Utah smelter-fuming plant.

Gold ore from the Gold Metals group of claims in the *Manhattan* district was amalgamated and yielded gold and silver. There was one gold-placer operation in the county; it was limited to sluicing gravel taken from a drift mine in the *Manhattan* district several years ago.

Less than 50 flasks of mercury was produced from 4 operations in the county in 1956. The principal production was from the Redbird No. 1 open-pit mine near Round Mountain. The other producers were: The A & B mine, in the *Tybo* district; the Magee mine, in Horse Canyon, 14 miles northwest of Manhattan; and the Lime Cap mine in the *Fluorine* district east of Beatty. Most of the county mercury yield was marketed in California. A few flasks were sold to a local buyer.

**Ormsby.**—The only mineral produced in the county in 1956 was sand and gravel. John L. Savage Construction Co. prepared sand and gravel for concrete aggregate from pits east of Carson City. Ormsby County and the Nevada Highway Department and its contractors quarried gravel for highway construction and repair.

**Pershing.**—Pershing County ranked second in State tungsten production; its mines produced ore that yielded over 65,000 short-ton units of $WO_3$. This was about 7 percent less than in 1955. Nevada-Massachusetts Co., the State's largest individual producer of tungsten concentrates, worked the Tungsten group of mines, 8 miles northwest of Mill City, by underground and open-pit methods and contributed more than 90 percent of the total tungsten output. Company ore was treated by gravity concentration, flotation, magnetic separation, and leaching methods at its plant near the mine site, and the concentrates were shipped to Government stockpiles.

The Wolfram Co., the second-ranking producer of tungsten ore in the county, operated the following properties: The Nightingale mine, 38 miles north of Fernley; Long Lease mine, 12 miles southeast of Lovelock; and Stormy Day mine (leased for first 7 months of 1956), 16 miles south of Gerlach. The Stormy Day mine was also operated

Digitized by Google

under lease by Nev-Tah Oil & Mining Co. The ores were concentrated at the Wolfram Co. mill in Toulon.

The remaining tungsten concentrates credited to the county came from ore mined at 25 operations in the county. Those, with the most noteworthy production, were: The Holiday Extension & Joe No. 2, Coon Can and Sugar Hill mines near Lovelock, operated by Wm. Cooney & Sons; the Holiday mine 4 miles southwest of Vernon was operated by Ellis K. Farnham, who shipped ore and concentrates to a Nevada buyer; and the M. G. L. property, 16 miles northeast of Nixon. The mine was worked by numerous operators, and the Metallurgical Development Co. re-treated the mill tailings. Both the mined ore and the tailings were treated in a Douglas County custom mill. Exploration for tungsten ore under a DMEA loan was begun in July at the Stormy Fraction (Thrasher) claim, 14 miles southeast of Gerlach, by the Cordero Mining Co.

The United States Gypsum Co. produced gypsum at the Empire gypsum quarry 10 miles south of Gerlach. The quarry extends into Washoe County, where the company gypsum-processing plant is located. The company also quarried perlite from its Pearl Hill mine northwest of Lovelock. The perlite was trucked to the company crushing and sizing plant at Kodak, and the graded material was transferred to the Empire expansion plant in Washoe County.

Pershing County was the source of over one-fourth of the Nevada's iron-ore production in 1956. This yield was 45 percent more than in 1955. All of the iron ore was mined by open-pit methods and came from the *Mineral Basin* district 35 miles southeast of Lovelock. The leading producer was Dodge Construction, Inc., which shipped magnetite from the Iron Horse (Ford) group of claims and a smaller tonnage of hematite from the Thomas pit (Southern Pacific Co. lease). The ore was shipped to California ports for export. The Nevada Iron Ore Co., Inc., also mined hematite from the north end of the Thomas pit and shipped ore to domestic steel plants and to California for export.

Mercury production in Pershing County increased 138 percent above that in 1955 and came from 16 operations. The principal producer was the Miller Basin (Eureka) mine near Kennedy, operated first by Walter Low and later by the Miller Basin Mining Co. This mine supplied almost 40 percent of the county output. Other major producing operations east and southeast of Lovelock, within a radius of 25 miles were: The Nevada Mercury Co. (Lori No. 1 mine); Biggs, Noble et al. (Black Jack mine); Warner Meissner (Eastern Star Nos. 0 & 1 claims); John E. Holmstrom (Freckles mine); and by C. A. Coppin (Redbird mine). Coppin also conducted exploration for mercury ore under a DMEA loan at this property, in the *Antelope Springs* district.

Pershing County and the Nevada Highway Department quarried over 70,000 tons of gravel for use in road construction and maintenance at various localities in the county; this was about 60 percent less than in 1955. John M. & Ott F. Heizer made a shipment of antimony ore, mined 5 years previous, from the Hollywood mine 27 miles southeast of Lovelock, to a Texas smelter.

The principal silver, and only lead and zinc, output credited to the county was from a small tonnage of lead-zinc ore produced at the

Digitized by Google

De Sota mine in the *Star* district 7 miles north of Unionville, by the Boyd-Endsley Mining Co. This ore, which was shipped to a California smelter-fuming plant, also contained recoverable copper and gold.

The only copper-ore production was a small tonnage that came from the Star Point mine near Unionville. This ore also contained small quantities of silver and gold and was shipped to a Utah smelter. Most of the county gold production was from placer operations. Gold and the coproduct silver were recovered by Constant Minerals Separation Process, Inc., from alluvium washed at its plant near the Barrel Spring deposit at Rabbit Hole and by Darrell V. Cole, who washed stream gravel, using small-scale hand methods, in the Willow Creek area approximately 12 miles southeast of Mill City.

**Storey.**—The Eagle-Picher Co., the only producer of diatomite in Storey County, was the leading producer in the State. The company operated the Celatom open pit 8 miles southwest of Wadsworth and trucked the quarried material to its processing plant at Clark Station, 12 miles southwest of Wadsworth on Highway No. 40. The diatomaceous earth was crushed, calcined, screened, and classified at the plant and the product shipped to various customers in the United States and Canada for use in insulation, refractories, filters, and miscellaneous applications. The demand about equaled that in 1955.

The gold and silver production in the county all came from the *Comstock Lode* district east and south of Virginia City. The minor gold production was 146 percent more than in 1955, while silver output decreased 38 percent. The principal producer was the Double King Mines, Inc., which worked the Silver Hill open-pit mine and treated the ore at the Donovan stamp mill and cyanide plant at Silver City (Lyon County). A small amount of gold and silver was recovered from material gathered in old mill cleanups in the district.

**Washoe.**—Sand and gravel was the principal mineral produced in the county; it amounted to 87 percent of the total value of the mineral production in 1956. The tonnage was 16 percent more than in 1955. Much of the increase was due to accelerated construction activity in the vicinity of Reno, especially the building of new homes. The leading producers of sand and gravel for structural and paving uses were Smith-Peterson & Co., Isbell Construction Co. (which operated a portable plant), and Bob Williams. Earl L. Gomes produced paving gravel with a portable plant, and George E. Miller (who prepared sand for paving and structural purposes) also crushed decomposed granite for use in top soil. The United States Bureau of Public Roads, the United States Army Corps of Engineers, and the Nevada Highway Department and their contractors produced sand and gravel for road construction and repair. Washoe County crushed basalt for concrete and road metal, and the Bureau of Indian Affairs crushed miscellaneous stone for road fill.

The United States Gypsum Co. operated its Empire gypsum-processing plant 10 miles south of Gerlach on gypsum produced at the company quarry adjacent to the plant. The quarry extends into Pershing County. The company also operated a perlite-expanding plant at Empire on crude perlite produced in Pershing County.

The Double Check Products Co. quarried calcareous marl 7 miles northeast of Flanigan. The marl was ground and mixed with other

Digitized by Google

ingredients to produce poultry and livestock feeds. Reno Press Brick Co. mined fire clay and miscellaneous clay at the Faith and Geiger pits near Steamboat Springs and at the Revelation pit 6 miles east of Sparks. The clay was used in refractory brick and block, and other heavy clay products manufactured at the company plant in Reno. The tonnage of clays produced was 35 percent more than in 1955.

Copper, gold, and silver were recovered at smelters from small tonnages of copper ore produced by Julius Redelius at the Big Ledge mine (in the *Peavine* district about 20 miles northwest of Reno) and by C. H. Foreman from the Silver Bell mine (in the *Pyramid* district about 20 miles northwest of Gerlach). The Galena Hill mine (in the *Galena* district 2 miles northeast of Steamboat) operated by Constant Minerals Separation Process, Inc., produced the only lead and zinc credited to the county, which was in silver ore reduced at a California smelter-fuming plant. The ore also contained a small percentage of recoverable copper. Fred J. De Longchamps worked the Red Bluff claim in the Pyramid area 25 miles north of Sparks and shipped uranium ore to a concentrating plant in Utah.

**White Pine.**—White Pine County led the State in the total value of mineral production in 1956. It was again first in yields of copper, gold, and clays and second in silver and lime. It was also the only producer of molybdenum concentrate in Nevada.

The principal output of copper, silver, and gold and all the molybdenum came from ore mined in the *Robinson* district, about 6 miles northwest of Ely. Production was by the Nevada Mines Division of Kennecott Copper Corp. and the Consolidated Coppermines Corp. The Kennecott Copper Corp. operated the Kimbley, Liberty, and Veteran open pits and the Minnesota-Hi underground mine. The Consolidated Coppermines Corp. operated the Tripp open pit—a consolidation of the old Morris and Brooks pits. As the two company holdings were contiguous, portions of the Veteran and Liberty pits, on Consolidated Coppermines Corp. property, were mined by the Kennecott Copper Corp. for Coppermines' account.

The copper ores were concentrated and reduced at the McGill mill and smelter, respectively, which were owned and operated by Kennecott Copper Corp. The blister-copper product was shipped to eastern refineries. The molybdenum concentrate, a byproduct of the milling operation, was also shipped out-of-State. The McGill smelter also received fluxing ores containing copper, gold, and silver from numerous mines in Nevada, California, and Utah.

The White Pine County properties in this group included the Siegel mine (in the *Aurum* district about 40 miles northeast of McGill) and the Sunnyside mine (in the *Robinson* district), producers of silver and gold-silver ore, respectively. The main producers of lead, which also contributed several hundred ounces of silver and some copper to the State total, from lead ore shipped to a Utah smelter were: The O. B. Mining Co., Ward mine, in the *Ward* district 12 miles south of Ely; and Andrew Dowd & Fred Harris, Belmont mine, Hamilton Land Co., Grand Prize mine, and Joe Nardi, Rocco Homestead mine, all in the *White Pine* district near Hamilton.

The relatively small zinc-production was derived from zinc ore shipped to a Utah smelter-fuming plant from the Kink claim in the

465877—58——49

Digitized by Google

*Robinson* district and from lead-zinc and copper-lead-zinc ores from the Crest (Lucky Larry) claims and the Great Valley mine, respectively, in the *White Pine* district. These ores also contained some recoverable gold and silver.

Exploration for lead-zinc ore under a DMEA loan was begun in March 1956 by Mount Wheeler Mines, Inc., at the Mount Wheeler mine 5 miles south of Wheeler Peak.

Cleanup operations at county placer properties in the Oceola district yielded gold and silver from deposits mined several years ago. About 6,400 short-ton units of $WO_3$ was contained in concentrates produced from tungsten ore mined in White Pine County during the year, which was 37 percent less than in 1955. The *Shoshone* district contributed a large percentage of this output, and the principal producers were the Everit mine and mill operated by Minerva Scheelite Mining Co. and the Minerva mine worked by M. I. A. Mines Co. Ore from the latter mine was concentrated at the Everit mill. M. I. A. Mines Co. also did exploration work for tungsten ore under the DMEA program.

In the *Tungstonia* district, Ely Uranium, Inc., operated the Antelope mine and shipped its ore to a Utah mill. Frank Roberts operated the Bay State mine in the *Newark* district, near the Eureka County line, and shipped tungsten ore to a Humboldt County mill. In the *Cherry Creek* district, another important source of tungsten ore, James E. Duval worked the Calcite No. 5 mine, and Benson & Ruggles and Twentieth Century Fuels, Inc. operated the Only Chance mine. The latter company also operated a custom mill at Cherry Creek on tungsten ores mined in that area. Exploration for tungsten ore, under the DMEA program, was undertaken at the Teresa mine in the *Tungstonia* district by Helmar Mining & Milling Co., Inc., and at the Valley View mine in the *Granite* district by Robert N. Salvi.

Limestone was quarried by Kennecott Copper Corp. near McGill for smelter flux and as a source of lime for the concentrating plant.

A small tonnage of quartzite was quarried near Baker by the Star Dust Mines, Inc., and sold as flagstone. Engine sand for the Nevada Northern Railroad and sand and gravel for aggregate in concrete and plaster were produced from a deposit in Spring Valley by Ely Sand & Gravel Co. The United States Forest Service, White Pine County, and the Nevada Highway Department and its contractors produced sand and gravel for road construction and repair at various localities in the county.

Manganese ore was mined by Manganese Mining Co. in the *Nevada* district 10 miles south of Ely and by Sam Robison at the Columbia mine in the *Robinson* district. The ore from both operations was shipped to Government stockpiles outside the State. Jeanette E. Bigger produced fire clay from the McDonough pit in Mosier Canyon east of Ely for local use in furnace mortar.

Digitized by Google

# The Mineral Industry of New Hampshire

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the New Hampshire State Planning and Development Commission.

By Joseph Krickich [1] and Mary E. Otte [2]

NEW HAMPSHIRE produced minerals in 1956 exceeding $3 million in value, a 32-percent increase over 1955. Substantial gains in the total value of stone, sand and gravel, and clays were enough to boost the State's total value above the $3 million mark, despite decreases in the value of mica, feldspar, beryllium, abrasives, and gem stones. Although sand and gravel continued for the third straight year to be the principal mineral product, the stone industry increased the most in 1956. This gain was due primarily to increased production of crushed miscellaneous stone for use as concrete aggregate and roadstone at the Portsmouth Air Base in Rockingham County. Mineral production was reported from every county; Merrimack, Rockingham, and Cheshire Counties, in order of decreasing value, were the centers of greatest mineral activity.

**TABLE 1.—Mineral production in New Hampshire, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Beryllium concentrate | 20 | $11,975 | (3) | (3) |
| Clays | 35,184 | 35,184 | 36,320 | $47,040 |
| Gem stones—pounds | (3) | 5,000 | (3) | 500 |
| Mica | 33 | 203,693 | 330 | 187,619 |
| Peat | 45 | (3) | 320 | (3) |
| Sand and gravel | 2,432,146 | 1,592,580 | 3,862,479 | 1,822,230 |
| Value of items that cannot be disclosed: Abrasive stones, columbium-tantalum (1955), feldspar, stone, and values indicated by footnote 2 | | 756,504 | | 1,378,492 |
| Total New Hampshire | | 2,605,000 | | 3,436,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Quantity not recorded.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Abrasives (Scythestones).**—Sales of scythestones (a quartz-mica schist) in 1956 declined slightly compared with 1955. Norton Pike Co. continued to be the only supplier of abrasive stone in New Hampshire. Sales were made from a stockpile of material produced in 1945 from the company quarry at Piedmont, Grafton County. The quarry has been closed since 1953.

**Clays.**—During 1956 production of clay increased 3 percent in tonnage and 34 percent in value. The output came from 4 operations; 1 each in Grafton and Strafford Counties and 2 in Rockingham County. Only miscellaneous clay was produced and utilized in manufacturing heavy clay products.

**Feldspar.**—Production of feldspar decreased sharply in 1956, compared with 1955. The decline primarily resulted from lowered demand for ground feldspar in manufacturing pottery, soap, and abrasives. Three companies reported production of feldspar from 4 operations—1 each in Cheshire and Sullivan Counties and 2 in Grafton County.

**Gem Stones.**—The production of gem stones during 1956 was limited to a crude topaz stone and other miscellaneous stones.

**Gypsum.**—Crude gypsum imported from New York was processed by the National Gypsum Co. at Portsmouth (Rockingham County) for manufacturing building materials.

**Mica.**—The production of sheet and scrap mica increased over 1955, but total valuation declined. The large increase in tonnage was due to greater sales of scrap mica to industry. Sales of full-trim mica to the Government through the GSA, Franklin, Merrimack County (N. H.) and Spruce Pine (N. C.) Purchase Depots decreased in 1956, causing the total mica value to decline slightly. Industry purchased punch, hand-cobbed, full-trimmed, scrap, and other mica, while in 1955 industry purchased only punch, hand-cobbed, half-trim, and scrap mica. The Government purchased only hand-cobbed and full-trim mica. The average price of sheet mica sold to industry increased, while the average price of sheet mica sold through GSA declined as compared with 1955. Ground mica was produced in Merrimack County and used in manufacturing paint, rubber, wallpaper, and plastics.

**Sand and Gravel.**—The sand and gravel industry ranked first in tonnage and value of total output in New Hampshire in 1956, contributing over half of the State's total value. During the year the tonnage of sand and gravel increased 59 percent, but the value increased 14 percent compared with 1955. Increased road repair and paving by the New Hampshire Department of Public Works and Highways was the major factor in the increased production of sand and gravel. Production of paving gravel increased considerably, but slight increases were reported for filter sand, sand as railroad ballast, and other sand, plus increased output of gravel for other uses. The production of sand for paving, structural purposes, and engines, as well as structural and railroad ballast gravel, declined during the year. Government-and-contractor output of sand and gravel in 1956 was reported in every

Digitized by Google

county, while commercial producers were active in all but Carroll and Sullivan Counties.

**Stone.**—Stone production continued to rank as the second most important mineral industry in New Hampshire in 1956. The production of crushed stone as concrete aggregate and roadstone increased sharply owing to increased road and airbase construction. Stone was produced in Rockingham, Merrimack, Grafton, Hillsboro, Carroll, and Coos Counties, in order of decreasing value, during the year. Dimension granite was produced as rough construction stone, rubble, dressed architectural stone, dressed monumental stone, and curbing and flagging stone. Dimension quartz was sold for use as rough architectural stone. Some granite was crushed for riprap and concrete aggregate, but the bulk of the State's crushed-stone production was miscellaneous stone used as concrete aggregate and roadstone.

## METALS

**Beryllium.**—Production of beryl in New Hampshire in 1956 was centered in Cheshire, Grafton, Rockingham, and Sullivan Counties, with most of the output coming from Grafton County. The Government purchased all beryl sold in 1956 through the GSA Franklin (N.H.) Purchase Depot.

**Columbium-Tantalum.**—No sales of columbite-tantalite produced in New Hampshire in 1956 were reported.

## MINERAL FUELS

**Peat.**—Production of peat in 1956 in New Hampshire increased sharply compared with 1955. This output, which was produced in Belknap County, was used for soil-improvement purposes.

**TABLE 2.—Value of mineral production in New Hampshire, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Belknap | (1) | (1) | Sand and gravel, peat, mica. |
| Carroll | (1) | $22,311 | Sand and gravel, stone. |
| Cheshire | $298,384 | 442,861 | Sand and gravel, mica, feldspar, beryl. |
| Coos | 8,369 | 10,450 | Sand and gravel, stone, gem stones. |
| Grafton | 443,341 | 330,603 | Sand and gravel, feldspar, mica, clays, stone, beryl, abrasives. |
| Hillsboro | (1) | (1) | Sand and gravel, stone. |
| Merrimack | (1) | (1) | Do. |
| Rockingham | (1) | (1) | Stone, sand and gravel, clays, beryl. |
| Strafford | (1) | (1) | Sand and gravel, clays. |
| Sullivan | (1) | (1) | Feldspar, sand and gravel, mica, beryl. |
| Undistributed [2] | 1,854,842 | 2,629,656 | |
| Total | 2,605,000 | 3,436,000 | |

[1] Value included with "Undistributed."
[2] Includes counties whose value must be concealed for particular years, as indicated by footnote 1, and a quantity unspecified by county.

## REVIEW BY COUNTIES

**Belknap.**—Tilton Sand & Gravel, Inc., operated a pit and fixed plant at Tilton, producing sand and gravel for building and road construction. The plant was idle during the winter months. The New Hampshire State Highway Department produced sand and gravel and purchased a quantity produced under contract for paving material.

Digitized by Google

Perkins Peat Bog, the only producer of peat in the State, recovered reed-sedge peat from a bog near Center Barnstead.

Patrick Dufour produced mica from the Tyeh and Keys mine near Lakeport and sold full-trim sheet mica to the GSA Spruce Pine (N. C.) Purchase Depot.

**Carroll.**—Sand and gravel was produced by New Hampshire Highway Department for paving material.

Cesare Trusiani reclaimed a small quantity of quartz from the Chandler quarry near Chatham, selling the stone as rough architectural blocks. Crushed granite for riprap was produced under contract for the New Hampshire Department of Public Works and Highways from quarries in Carroll County.

**Cheshire.**—Keene Sand & Gravel, Inc., operated a pit and fixed plant at Swanzey, producing washed sand and gravel for paving and road material, sand for filter use, and a quantity of unwashed sand for miscellaneous uses. Warren H. Plimpton produced bank-run sand and gravel for the town of Dublin and unwashed sand and gravel for use by industry as paving and road material. Washed sand and gravel for building purposes and paving gravel was produced by Cold River Sand & Gravel Corp. from a pit and fixed plant near Walpole.

In terms of total value, Cheshire County was the leading mica-producing county in the State in 1956. Strafford Mines, Inc., operated mines near Alstead; and Otto K. Lassmann produced hand-cobbed mica at the French mine near Gilsum, and sold it to the GSA operated Government Franklin (Merrimack County, N. H.) Purchase Depot. In addition, Otto K. Lassmann prepared and sold sheet mica to industry.

Golding-Keene Co. produced crude potash-type feldspar at the Colony mine near Alstead, and ground the feldspar at the local company-owned grinding plant.

Production of beryl was reported by Golding-Keene Co. from the Colony mine and Otto K. Lassmann from French mine, both at Alstead; and John L. Maderic, Clarke mine, near Gilsum. The entire output of beryl was sold to the GSA Franklin (N. H.) Purchase Depot.

**Coos.**—Lessard Sand & Gravel Co. (Gorham) produced a quantity of washed sand, and Clyde B. Gray produced washed gravel for paving and road structure. Fred Corrigan recovered a small quantity of unwashed paving and road sand from a pit near Randolph. Maine Central Railroad Co. produced gravel for railroad ballast from a pit near Colebrook.

Crushed granite for riprap was produced under contract for the New Hampshire Department of Public Works and Highways.

Gem material of the topaz variety was mined by Orman McAllister near Baldface Mountain, north of North Chatham. This producer reported that interest in the collection of gem stones by rock hounds is increasing, and he will have a few locations of his own in 1957.

**Grafton.**—Producers of sand and gravel in 1956 were Littleton Sand & Gravel Co., Inc., Littleton; Campton Sand & Gravel Co., West Campton; D. & L. Manufacturing Corp.; and K. Curran. The output was principally for paving material, while a quantity of sand was produced for structural purposes. The New Hampshire State High-

Digitized by Google

way Department produced, as well as purchased, a quantity of sand and gravel for paving material.

Whitehall Co., Inc., operated the Ruggles open-pit mine near Grafton, producing crude potash-type feldspar for the parent company—The Oxford Soap Co., Manchester, Conn. Crude potash-type feldspar also was mined by Golding-Keene Co. from the Lot No. 10 mine near Canaan, and shipped to the company-owned grinding plants at Alstead, N. H., and Trenton, N. J.

Mica was mined from 17 underground and open-pit mines operated by 16 companies in 1956. Sales of mica consisted primarily of hand-cobbed and full-trim sheet mica of which a large quantity was sold to the Government through the GSA (Spruce Pine, N. C., and Franklin, N. H.) Purchase Depots. Two of the companies also sold hand-cobbed, full-trim, punch mica to industry. A small quantity of scrap mica was produced. The 10 leading producers of mica in Grafton County in 1956 were:

| Company: | *Mine* | *Location* |
|---|---|---|
| Bernice and John L. Maderic | Keys | Rumney. |
| Do | New | Do. |
| Whitehall Co., Inc | Ruggles | Grafton. |
| Donald E. Esty | Donald Esty | Hebron. |
| Charles E. Dufour | Baer-Prospect | Orange. |
| Do | Hoyt Hill | Do. |
| Ashley Mining Corp | Keyes | Do. |
| Henry C. Robinson | Crystal | Campton. |
| H. C. Bowles | Atwood | West Rumney. |
| Do | Bowles Prospect | Groton. |
| Do | Keyes | Orange. |
| Do | Nate Coffin Ledge | Rumney. |
| Leonard A. Guraldi & Son | Good Old Larry | Grafton. |
| W. D. Wood, Inc | Ruggles | Do. |
| Do | Hoyt Hill | Orange. |
| Larry Eaton | Larry Eaton | Groton. |

Densmore Brick Co. (Lebanon) produced miscellaneous clay from an open-pit mine for manufacturing building brick.

Crushed granite for riprap, concrete aggregate, and roadstone was produced under contract for the New Hampshire Department of Public Works and Highways.

Grafton County continued to lead in beryl production in 1956. Four producers reported output of beryl: John L. Maderic operated the Plume mine, North Groton; Whitehall Co., Inc., Ruggles mine, Grafton; Edward Albert, Albert mine, Groton; and Martha B. Tibbetts, Groton. All beryl was sold to the Government Franklin (N. H.) Purchase Depot.

Norton Pike Co. (Littleton) continued to sell scythestones from its stockpile, since the Pike quarry was closed permanently as of January 1953.

**Hillsboro.**—Robie Construction Co., Inc. (Manchester) and The Harris Construction Co., Inc. (Peterborough) recovered sand and gravel for structural and paving material. The Manchester Department of Highways (Manchester) and the New Hampshire State Highway Department reported production of sand and gravel for paving purposes.

Digitized by Google

Granite crushed for riprap, concrete aggregate, and roadstone was produced under contract for the New Hampshire Department of Public Works and Highways.

**Merrimack.**—Merrimack County was the leading mineral-producing county in the State in 1956, supplying 36 percent of the total value of mineral output. It also led in the production of sand and gravel. Sand and gravel was recovered from a pit and prepared at a fixed plant at Hooksett by Manchester Sand, Gravel & Cement Co., Inc. The major part of the production was sold for building and paving material and small quantities were sold for engine sand, filter sand, and railroad ballast. The New Hampshire Department of Public Works and Highways reported a large output of sand and gravel recovered by the construction and maintenance crews for paving material, as well as purchased quantities of sand and gravel produced under contract. The commissioner of public works, Concord, reported production of paving and road sand and gravel for local use.

The John Swenson Granite Co., Inc., operated the Swenson Gray quarry and crusher at Concord and produced dimension granite for rough construction, rubble, dressed architectural stone, monumental stone, and curbing and a small quantity crushed for use as concrete aggregate, roadstone, and screenings.

Concord Mica Corp. (Penacock) ground crude and factory scrap mica for manufacturing paint, rubber, wallpaper, and plastics.

The Government, through the GSA Franklin (N. H.) Purchase Depot bought hand-cobbed and full-trim mica, as well as beryl. Beryl and mica produced in Cheshire, Grafton, Rockingham, and Sullivan Counties was purchased by the Government for stockpiling.

**Rockingham.**—More stone was produced in Rockingham County than in any other county in the State in 1956 and increased in comparison with 1955. Morrison-Knudsen Co., Inc., and Landers & Griffin, Inc., continued to operate the Iafolla quarry at Portsmouth, which was leased from the John Iafolla Estate. Output consisted of miscellaneous stone crushed for concrete aggregate, roadstone, and screenings. Granite was produced under contract for the New Hampshire Department of Public Works and Highways and crushed for riprap, concrete aggregate, and roadstone.

From an open pit at Exeter, L. Chester & Clayton W. Simpson produced sand for building sand and gravel for fill and cement manufacture. Merle Simes (Kingston) sold a small tonnage of building sand. The New Hampshire State Highway Department also reported producing sand and gravel for paving material.

Miscellaneous clay was mined from open-pit mines by Eno Bros. Brick Co. (Exeter) and W. S. Goodrich, Inc. (Epping), for the manufacture of heavy clay products.

Phillip Morrill operated various beryl mines near Derry and sold the production to Government Franklin (N. H.) Purchase Depot.

National Gypsum Co. transported crude gypsum from the Clarence Center (N. Y.) mine to its mill at Portsmouth, N. H., for processing. The processed material was marketed mainly for building materials.

**Strafford.**—Sand and gravel was produced by Dover Sand & Gravel, Inc., Dover; Kenneth Allen, Rochester; and James S. Pike, Lee.

Digitized by Google

Output was utilized principally for building sand and gravel, and paving and road gravel.

Strafford County was the leading clay-producing county in the State in 1956. New England Brick Co. recovered miscellaneous clay from an open-pit mine near Rochester, for manufacturing heavy clay products.

**Sullivan.**—Crude potash-type feldspar was mined by J. F. Morton, Inc., from an underground mine north of Alstead in Sullivan County and trucked to the company-owned grinding plant at Cold River. This company discontinued operation in September 1956 and sold out to Foote Mineral Co. (Philadelphia, Pa.) in December of the same year.

A small quantity of sand and gravel for paving was produced by the New Hampshire State Highway Department.

Smith Mica Co. operated the Upper Smith mine near Claremont, and Martha B. Tibbetts, the Crystal and Fellows mines near Springfield, producing hand-cobbed and full-trim sheet mica for sale under the Government Purchase program to the GSA Franklin (N. H.) Purchase Depot.

Elmer B. Rowley and Smith Mica Co. mined beryl from the Beryl Mountain mine (Acworth) and the Upper Smith mine (Claremont) respectively. Both companies sold the beryl through the GSA Franklin (N. H.) Purchase Depot.

Digitized by Google

Digitized by Google

# The Mineral Industry of New Jersey

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior and the New Jersey Division of Planning and Development, Bureau of Geology and Topography.**

By Joseph Krickich [1] and Geraldine C. Slaypoh [2]

NEW JERSEY mineral production exceeded $64 million in value, an increase of 12 percent compared with 1955. This rise was due to the increased valuation of stone, sand and gravel, and iron ore, the leading mineral commodities in the State. These minerals furnished 87 percent of the State's total value. The output of zinc and manganiferous residuum declined sharply because of an 8-month shutdown at the Sterling Hill mine. Mineral production was reported from all counties; Morris, Somerset, Cumberland, Passaic, and Sussex Counties, in decreasing order of value, were the centers of greatest mineral activity. Mineral output from these counties supplied 71 percent of the State's total mineral value.

**TABLE 1.—Mineral production in New Jersey, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 644,192 | $1,561,994 | [3] 651,080 | [3] $2,213,965 |
| Gem stones pounds | 10 | 16 | (3) | 100 |
| Iron ore (usable) long tons gross weight | 759,550 | 13,633,370 | 911,535 | 16,841,752 |
| Manganiferous residuum gross weight | 213,370 | (4) | 130,129 | (4) |
| Peat | 26,358 | 229,065 | (4) | (4) |
| Sand and gravel | 11,152,552 | 16,424,417 | 11,194,412 | 18,238,745 |
| Stone | [5] 8,357,599 | [5] 17,527,890 | 9,012,323 | 20,825,024 |
| Sulfur, recovered elemental long tons | 7,404 | 243,984 | 8,972 | 291,413 |
| Zinc (recoverable content of ores, etc.) [6] | 11,643 | 2,863,945 | 4,667 | 1,259,530 |
| Value of items that cannot be disclosed: Ball clay (1956), lime, magnesium compounds, marble (1955), marl (greensand), and value indicated by footnote 4. Excludes limestone used in manufacturing lime (1955–56) | | 5,010,313 | | 4,608,856 |
| Total New Jersey | | 57,495,000 | | 64,279,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes ball clay.
[3] Quantity not recorded.
[4] Figure withheld to avoid disclosing individual company confidential data.
[5] Excludes marble.
[6] Recoverable zinc valued at the yearly average price of Prime Western slab zinc, East St. Louis market. Represents value established after transportation, smelting, and manufacturing charges have been added to the value of ore at mine.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical Clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## METALS

**Iron Ore.**—In comparison with 1955, production of crude iron ore and shipments of usable ore in New Jersey increased 26 and 20 percent, respectively. Of the total crude ore mined, 93 percent was concentrated before shipment, and the remainder was shipped as direct ore. The average price of New Jersey's iron ore rose from $17.95 in 1955 to $18.48 in 1956. Four underground mines were active—3 in Morris County and 1 in Warren County. Warren Foundry & Pipe Corp., at the Mount Hope mine in Morris County, changed the firm's name to Shahmoon Industries, Inc., on May 10, 1956.

**TABLE 2.—Production and shipments of iron ore, 1947–51 (average) and 1952–56, by uses, in long tons**

| Year | Number of mines | Crude ore mined | Shipments of usable ore | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Direct shipping ore | Concentrates for pig iron | Cement | Paint | Miscellaneous | Total shipments | Value |
| 1947–51 (average) | 4 | 994,918 | 141,676 | 364,804 | 11,589 | 301 | 1,607 | 519,977 | $5,072,146 |
| 1952 | 5 | 1,318,599 | 166,962 | 505,136 | 13,272 | 96 | ---- | 685,466 | 6,760,467 |
| 1953 | 5 | 1,558,384 | 177,475 | 633,128 | 5,302 | ---- | ---- | 815,905 | 10,114,970 |
| 1954 | 5 | 1,025,057 | 18,584 | 456,379 | 1,229 | ---- | ---- | 476,192 | 6,621,881 |
| 1955 | 4 | 1,455,891 | 164,238 | 595,312 | ---- | ---- | ---- | 759,550 | 13,633,370 |
| 1956 | 4 | 1,831,391 | 144,663 | 766,791 | ---- | 81 | ---- | 911,535 | 16,841,752 |

**Magnesium Compounds.**—Refractory magnesia was produced from dolomite and raw sea water by Northwest Magnesite Co., Cape May County. Johns-Manville Corp. (Somerset County), and J. T. Baker Chemical Co. (Warren County) produced various refined magnesium compounds from purchased dolomite and magnesium compounds. Johns-Manville Corp. discontinued the manufacture of precipitated magnesium carbonate in May 1956. To avoid duplicating output data, only the magnesia produced from sea water is included in the mineral output of the State.

**Manganiferous Residuum.**—Manganiferous residuum was obtained as a byproduct in the process of recovering zinc from a manganiferous zinc ore mined in Sussex County.

**Zinc.**—Output of zinc in New Jersey continued to decline in 1956. Production decreased substantially compared with 1955 owing to the shutdown of the New Jersey Zinc Co. Sterling Hill mine, Sussex County (the only producing zinc mine in the State), during the first 8 months of the year. A shutdown resulted in August 1955 when the company and the mine employees, members of the United Mine Workers, failed to reach an agreement during contract negotiations. The mine reopened on September 4, 1956, when the labor dispute was settled.

Digitized by Google

**TABLE 3.—Mine production of recoverable zinc, 1947–51 (average) and 1952–56**

| Year | Short tons | Year | Short tons |
|---|---|---|---|
| 1947–51 (average) | 64,427 | 1954 | 37,416 |
| 1952 | 59,190 | 1955 | 11,643 |
| 1953 | 45,700 | 1956 | 4,667 |

## NONMETALS

**Clays.**—Production and value of clays in New Jersey increased, compared with 1955. The increased valuation was due to use of the market value of a large proportion of the prepared clay sold or used in 1956 rather than the value of the crude clay at the pit or mine; in most instances the latter was used in 1955. There were 21 open-pit operations in 10 counties. The leading clay-producing counties during the year were Middlesex, Cumberland, Warren, and Somerset, in order of decreasing value. The varieties of clays recovered from New Jersey's pits were ball, fire, and miscellaneous.

Most of the fire-clay output was used for refractories and heavy clay products. Ball clay was employed exclusively for refractories. The principal use of miscellaneous clay was in manufacturing heavy clay products, such as building brick, paving brick, draintile, sewer pipe, and kindred products.

**Gem Stones.**—A quantity of crude gem stones was recovered from unspecified places in New Jersey through the efforts of several amateur gem collectors.

**Gypsum.**—National Gypsum Co. and Barrett Division, Allied Chemical & Dye Corp., calcined gypsum and manufactured finished gypsum building products at plants in New Jersey. Barrett Division, Allied Chemical & Dye Corp. acquired the operations of the Newark Plaster Co. on February 1, 1956. Crude gypsum was calcined in kettles at Allied Chemical's Newark plant (Essex County) and transferred to its South Kearny plant (Hudson County) to be made into finished building products. In August 1956 National Gypsum Co. officials announced completion of the company's new multimillion-dollar gypsum-processing plant at Burlington, Burlington County.[3] The original plans for this plant included a wharf and a dock to receive raw gypsum from Nova Scotia. The plant was expected to consume 350,000 tons of raw material annually.[4]

**Lime.**—Limestone Products Corp. of America, Sussex County, was the only active producer of hydrated lime in New Jersey during 1956. The output was used for building, agricultural, chemical, and industrial purposes. Peapack Limestone Quarry, Inc., Somerset County, was idle during the year.

**Marl, Greensand.**—Production of greensand marl in New Jersey in 1956 was limited to 1 operation compared with 3 in 1955. Inversand Co. produced refined greensand marl from an open pit in Gloucester County for use in water softening.

**Perlite.**—Four plants in Middlesex, Passaic, Somerset, and Union Counties expanded crude perlite shipped from Southwestern United

[3] Pit and Quarry, vol. 49, No. 2, August 1956, p. 48.
[4] Pit and Quarry, vol. 48, No. 7, January 1956, p. 23

Digitized by Google

States. The expanded perlite was used primarily for plaster aggregate, concrete aggregate, and pipe insulation.

**Pigments.**—Black, brown, red, and yellow iron oxide pigments were manufactured in New Jersey at plants in Essex, Mercer, and Middlesex Counties.

**Sand and Gravel.**—Production of sand and gravel increased slightly compared with 1955; value rose 11 percent owing to increased valuation of raw material. The average price of sand and gravel produced by commercial and by Government-and-contract operations rose from $1.52 and $0.48, respectively, to $1.63 in 1955 and $1.08 in 1956. Output of sand and gravel was reported from all counties except Hunterdon and Somerset. Ninety percent of the sand and gravel produced in the State during the year was washed, screened, or otherwise prepared. Most of the sand output was utilized for building, molding, and paving. Gravel was used principally for building and paving. The chief sand and gravel producing counties, in order of decreasing output, were Cumberland, Morris, Middlesex, and Bergen. Sand was ground and used principally for filler and foundry purposes in Cumberland, Middlesex, and Ocean Counties. Ground sand also was used in abrasive, enamel, glass, pottery, porcelain, and tile manufacture. The output of Government-and-contractor sand and gravel was limited to Camden and Mercer Counties and furnished less than 1 percent of the State's total production.

**TABLE 4.—Sand and gravel sold or used by producers, 1955–56, by classes of operation and uses**

| Uses | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| COMMERCIAL OPERATIONS | | | | |
| Sand: | | | | |
| Glass | 901,096 | $2,152,264 | (1) | (1) |
| Molding | 1,493,294 | 3,682,833 | 1,766,525 | $4,464,229 |
| Structural | 3,219,280 | 3,035,794 | 3,784,795 | 3,726,538 |
| Paving | 1,722,616 | 1,455,233 | 1,235,148 | 1,069,432 |
| Grinding and polishing | | | 15,172 | 57,911 |
| Blast | 120,610 | 411,446 | 81,386 | 335,176 |
| Fire or furnace | 20,605 | 38,417 | 13,449 | 24,552 |
| Railroad Ballast | | | (1) | (1) |
| Other [2] | 541,133 | 1,496,894 | 568,031 | 1,753,728 |
| Gravel: | | | | |
| Structural | 1,597,621 | 2,684,510 | 1,569,084 | 2,886,765 |
| Paving | 932,978 | 1,056,621 | 1,099,616 | 1,337,494 |
| Railroad Ballast | (1) | (1) | | |
| Other | 56,007 | 67,261 | 34,669 | 82,506 |
| Undistributed [3] | 69,087 | 113,209 | 954,573 | 2,422,518 |
| Total | 10,674,327 | 16,194,482 | 11,122,448 | 18,160,849 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | |
| Sand: | | | | |
| Paving | 430,475 | 206,950 | 13,410 | 24,138 |
| Gravel: | | | | |
| Structural | | | 5,604 | 1,961 |
| Paving | 47,750 | 22,985 | 52,950 | 51,797 |
| Total | 478,225 | 229,935 | 71,964 | 77,896 |
| Grand total | 11,152,552 | 16,424,417 | 11,194,412 | 18,238,745 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes ground sand.
[3] Includes engine and filter sand, and those uses indicated by footnote 1.

Digitized by Google

**Stone.**—In terms of value, stone was New Jersey's leading mineral commodity in 1956, contributing 32 percent of the State's total value of mineral production. Basalt, granite, limestone, miscellaneous stone, and marble, in order of decreasing output, were quarried and crushed during the year. A small quantity of dimension sandstone and dimension miscellaneous stone for use in rough construction also was reported. Most of the output of crushed stone was used for concrete aggregate and roadstone. Crushed and broken stone used as riprap flux, agricultural stone, terrazzo, and other purposes also was produced. The leading stone-producing counties were Somerset and Passaic. A small tonnage of crushed miscellaneous stone was produced in Morris County under Government contract. Oystershell was ground in Gloucester County for use as poultry grit. Four companies produced roofing granules at plants in Bergen, Passaic, and Somerset Counties.

**TABLE 5.—Stone sold or used by producers, 1955–56, by uses**

| Uses | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Crushed and broken stone: | | | | |
| Riprap | 913,310 | $1,779,270 | 251,452 | $495,418 |
| Crushed stone | 6,970,022 | 13,924,487 | 8,129,176 | 17,344,777 |
| Agricultural | 126,696 | 435,076 | (1) | (1) |
| Other | [2] 347,571 | [2] 1,389,057 | [3] 631,695 | [3] 2,484,829 |
| Total | 8,357,599 | 17,527,890 | 9,012,323 | 20,825,024 |

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Includes fluxing stone and miscellaneous other uses.
[3] Includes dimension stone for rough construction, fluxing stone, crushed marble for terrazzo, oystershell for poultry grit, and miscellaneous other uses.

**Sulfur.**—Brimstone and flotation sulfur paste were recovered as byproducts in the liquid purification of gas in New Jersey in 1956. Two companies were active during the year in Gloucester, Camden, and Hudson Counties.

**Vermiculite.**—Imported crude vermiculite was processed at exfoliating plants in Hudson, Essex, and Mercer Counties. Most of the output was used as insulation, concrete aggregate, and plaster aggregate.

## MINERAL FUELS

**Peat.**—Reed-sedge peat used for soil improvement and mixed fertilizers was recovered in Sussex County in 1956.

## REVIEW BY COUNTIES

**Atlantic.**—Sand and gravel was produced in Atlantic County in 1956 by Taggert Brimfield Co., Cedar Lake; Tri-State Sand Co., Buena; Somers Point Sand & Gravel Co., Somers Point; Absecon Island Sand Co., Oceanville; and Dominic Macrie, Folsom. The output was used for building purposes and as molding sand.

**Bergen.**—Bergen County pits yielded sand and gravel, which was used for structural and paving purposes. Active producers were: Samuel Braen & Co., Mahwah; Braen Sand & Gravel Co., Wyckoff;

Digitized by Google

McKee Bros., Inc., Ramsey; and Ferdinand and Michael DiMaggio, Paramus. Alluvial clays for heavy clay products were produced by Tri-County Brick Corp. at Moonachie near Carlstadt. Hackensack Brick Co. did not operate during 1956. Artificially colored roofing granules were produced by the Flintkote Co. (East Rutherford).

**TABLE 6.—Value of mineral production in New Jersey, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Atlantic | $118,507 | $114,374 | Sand and gravel. |
| Bergen | 1,350,537 | 1,340,096 | Sand and gravel, clays. |
| Burlington | 1,179,747 | 770,570 | Do. |
| Camden | 900,770 | 1,138,600 | Sand and gravel, clays, recoverable sulfur, stone. |
| Cape May | 2,518,600 | (1) | Magnesium compounds, sand and gravel. |
| Cumberland | 6,821,922 | 7,752,781 | Sand and gravel, clays. |
| Essex | (1) | (1) | Stone, sand and gravel. |
| Gloucester | 641,891 | 770,674 | Sand and gravel, recoverable sulfur, greensand marl, stone. |
| Hudson | 87,650 | 87,703 | Sand and gravel, recoverable sulfur. |
| Hunterdon | 840,683 | (1) | Stone. |
| Mercer | 966,594 | (1) | Stone, sand and gravel. |
| Middlesex | 2,539,162 | 3,117,700 | Clays, sand and gravel. |
| Monmouth | 917,866 | 943,705 | Sand and gravel, clays. |
| Morris | 14,447,638 | 17,677,009 | Iron ore, sand and gravel, stone, clays. |
| Ocean | 844,527 | 568,413 | Sand and gravel. |
| Passaic | 4,475,389 | 5,731,188 | Stone, sand and gravel, clays. |
| Salem | (1) | 2,543 | Sand and gravel. |
| Somerset | 7,367,406 | 9,280,290 | Stone, clays. |
| Sussex | 7,194,728 | 5,024,660 | Stone, zinc, manganiferous residuum, lime, peat, sand and gravel. |
| Union | 1,269,727 | 989,025 | Stone, sand and gravel. |
| Warren | 2,320,001 | (1) | Iron ore, sand and gravel, stone, clays. |
| Undistributed [2] | 691,629 | 8,970,054 | |
| Total | 57,495,000 | 64,279,000 | |

[1] Value included with "Undistributed."
[2] Includes counties whose value must be concealed for particular years as indicated by footnote 1 and a quantity unspecified by county.

**Burlington.**—Molding and paving sand and structural sand and gravel were produced in Burlington County in 1956. Producers were Amico Sand & Gravel Co. (River Road and Norman Avenue), Riverside; George F. Pettinos, Inc., Mount Holly; Lockhart, Inc., East Riverton; and H. R. Sherman, Burlington. Heavy clay products were manufactured from clay mined by Church Brick Co. and Graham Brick Manufacturing Co. at Fieldsboro and Maple Shade, respectively. National Gypsum Co. manufactured calcined gypsum and finished gypsum building products from crude material imported from Nova Scotia at its new multi-million-dollar Burlington plant. Compared with 1955, no greensand marl was produced in Burlington County in 1956. The Permutit Co. reported the permanent shutdown of its greensand-marl operation near Birmingham. Zeolite Chemical Co. (Medford) did not produce greensand marl during the year.

**Camden.**—Bridgeton Sand Co. (Williamstown Junction), produced glass, molding, and miscellaneous sands. Sand and gravel for building, paving (including asphalt sand), and miscellaneous uses and molding sand were produced in Camden County by: Russell H. Ward, Inc., Palmyra; Taggart Brimfield Co., Hammonton; George F. Pettinos, Inc., Grenloch; Reading Sand Co., Penbryn; Pine Valley Sand & Gravel Co., Inc., Berlin; and Atco Sand Co., Berlin. The construction and maintenance crews of the Camden County Highway Department produced unprepared structural and paving gravel. The Alliance Clay Products Co., at an open-pit mine near Winslow

Digitized by Google

Junction, produced miscellaneous clay used in manufacturing heavy clay products. Flotation sulfur paste was recovered as a byproduct by the Thylox process from gases by Public Service Electric & Gas Co. at its Camden coke plant. Russell H. Ward, Inc. (Palmyra), quarried and sold crushed and broken miscellaneous stone for use as concrete aggregate, road material, and screenings.

**Cape May.**—Northwest Magnesite Co. recovered refractory magnesia from seawater and dolomite at its Cape May plant. Building and paving sand and gravel and sand for other uses was recovered by Menantico-Tuckahoe, Tuckahoe; John F. Gandy, Ocean View; and Courtland Sand & Gravel Co., Cape May Court House.

**Cumberland.**—Cumberland County was the leading sand and gravel producing county in New Jersey and ranked second in value of output of clays. The sand and gravel was used as foundry, glass, blast, engine, and filter sand, and as structural and paving material. Producers were: Armstrong Cork Co., Brunetti Bros., and Diamond Sand & Stone Co., all of Vineland; Daniel Goff Co., Inc., Menantico-Tuckahoe, National Pulverizing Co., New Jersey Silica Sand Co., Pennsylvania Glass Sand Corp., and George F. Pettinos, Inc., all of Millville; Jesse S. Morie & Son, Inc., Mauricetown; George F. Pettinos, Inc., Manumuskin; South Jersey Sand Co., Newport and Dividing Creek; Whitehead Bros. Co., Dividing Creek; Millville Silica Sand & Gravel Co., Inc., Port Elizabeth; and Menantico-Tuckahoe, Tuckahoe. The production of ground sand used as foundry, abrasive and filler sand and for enamel, glass, pottery, porcelain, and tile manufacture and other miscellaneous uses was also reported. Producers were National Pulverizing Co., Pennsylvania Glass Sand Corp. and South Jersey Sand Co. The Daniel Goff Co., Inc., open-pit mine near Millville produced fire clay for refractory mortar, foundries, and steel works. J. Dallas Castor discontinued grinding oystershell in 1956.

**Essex.**—Orange Quarry Co., West Orange, quarried and crushed traprock, which was used as riprap, concrete aggregate, and roadstone. The company also produced a small quantity of paving and road sand and sand used in bridges and culverts. Barrett Division, Allied Chemical & Dye Corp., acquired the Newark plant of Newark Plaster Co. on February 1, 1956. The company produced calcined gypsum and transferred the output to its Hudson County plant, where it was processed into finished building material. Vermiculite Industrial Corp. imported crude material from South Africa and exfoliated vermiculite at its plant near Newark during the year. E. I. du Pont de Nemours Co., Inc., manufactured a small quantity of hydrated ferric oxide pigments at its plant near Newark.

**Gloucester.**—Sand and gravel was produced in Gloucester County by L. R. Curtis, Bridgeport; Downer Silica Co., Downer; F. R. Warner, Inc., Bridgeport; and Wenonah Sand & Gravel Co., Mount Royal. The output consisted mainly of structural and paving sand and gravel and a quantity of furnace sand. Sulfur was recovered by the modified Baehr process at the Eagle Point plant of Freeport Sulfur Co. near Westville. Greensand marl was produced at a surface mine 2 miles from Sewell by the Inversand Co. and sold for treating water. Joseph Bauder & Sons recovered oystershell, which was ground and used for poultry grit.

465877—58——50

Digitized by Google

**Hudson.**—Thomas Henry Material, Inc. (West New York), produced sand and gravel for building and paving purposes. The Harrison Gas Works of Public Service Electric & Gas Co. operated during 1956 and recovered flotation sulfur paste as a byproduct of gas production. The Seaboard plant of the Koppers Co., Inc., produced hydrogen sulfide by hot-vacuum activation at its Seaboard plant near Kearny. Barrett Division, Allied Chemical & Dye Corp., acquired the South Kearny Plant of Newark Plaster Co. on February 1, 1956, and produced building materials from gypsum calcined at its plant in Essex County. F. E. Schundler & Co., Inc., exfoliated vermiculite near South Kearny, using crude material from South Africa.

**Hunterdon.**—Dimension miscellaneous stone and dimension sandstone used as rough building material were quarried by the Delaware Quarries (Hunterdon). Lambertville Quarry Co. (Lambertville) and Barlow Materials Co. (Oldwick) quarried diabase (basalt) for use as riprap, concrete aggregate, road material, and railroad ballast. A dark granite was quarried by Trimmer Stone Co. (Hunterdon) for concrete, road material, and screenings. M. C. Mulligan & Son, formerly Mulligan Lime Quarry, quarried and crushed limestone used for concrete aggregate and roadstone.

**Mercer.**—Pennington Quarry Co. (Pennington) produced diabase for use as concrete aggregate, road material, and railroad ballast. Crosswicks Sand & Gravel Co. (Groveville) and J. B. Richardson (Trenton) produced building and paving sand and gravel during 1956. Paving sand and gravel was produced under contract for the United States Army Corps of Engineers. Zonolite Co. exfoliated vermiculite from crude material, largely from Montana, South Carolina, and partly from South Africa. Columbian Carbon Co. (Trenton) manufactured black, brown, red, and yellow iron oxide pigments in 1956.

**Middlesex.**—The leading clay-producing area in New Jersey was again Middlesex County. McHose Clay Co. (Fords) and Such Clay Co. (South Amboy) produced ball clay for refractory use and fire clay for stoneware, heavy clay products, and refractory use. Fire clay used for stoneware refractories and heavy clay products was produced by Crossman Co., Sayre & Fisher Brick Co., and Whitehead Bros. Co., all of Sayreville; H. C. Perrine & Son, Matawan; Quigley Co., Inc., Fords; Valentine Fire Brick Co., Woodbridge; Natco Corp., Keasbey; and Marcus S. Wright, Milltown. Natco Corp (Keasbey) also produced miscellaneous clay for heavy clay products. Structural and paving sand and gravel was produced by Crossman Co., Sayreville; Dallenbach Sand Co., Inc., and Glenn Rock Concrete Products Co., Jamesburg; Herbert Sand Co., Inc., Milltown; and Raritan River Sand Co., Nixon. Molding sand was produced by Whitehead Bros., Sayreville. South River Sand Co. (Old Bridge) produced ground sand and blast and building sand. Crossman Co. (Sayreville) had an output of furnace and engine sand. Crude perlite was processed by the Coralux Perlite Corp. of New Jersey at its plant near Metuchen from material produced in the Southwestern United States. Stabilized Pigments, Inc., manufactured red iron oxide pigments (calcined copperas) in Middlesex County at its plants near New Brunswick and Monmouth Junction.

**Monmouth.**—Structural and paving sand and gravel was produced in Monmouth County by Bennett Sand & Gravel Co., Inc., and Frank Z. Sindlinger, Inc., Manasquan; Hause Gravel Co., Allenwood; New

Digitized by Google

Jersey Gravel & Sand Co., Farmingdale; Joseph Scarano, Wayside; W. S. Van Hise, Belmar; Walling & Son, Hazlet; and Preston Bros. Bennett Sand & Gravel Co., Inc., and Hause Gravel Co., prepared filter sand. The output of an open-pit clay mine, which was operated by Oschwald Brick Works, Inc., near Lawrence Harbor was used in manufacturing building brick.

**Morris.**—Morris County continued to lead in value as a mineral-producing county of New Jersey and furnished 28 percent of the State's total value. Iron ore, the principal mineral of the county, was recovered from the Mount Hope mine, Shahmoon Industries, Inc. (formerly Warren Foundry & Pipe Corp.); Scrub Oak mine, Alan Wood Steel Co.; and Richard Ore mine, Colorado Fuel & Iron Corp. Morris County ranked second in the 19 counties producing sand and gravel. Sand and gravel, used principally for structural and paving purposes, was produced by Consolidated Stone & Sand Co., Riverdale; North Jersey Quarry Co., Netcong; Sequine-Bogert Co., Inc., Kenvil; Alan Wood Steel Co., Dover; Thomas Landi & Sons, Morristown; Pequannock Sand & Gravel Co., Pequannock; Wharton Sand & Stone Co., Montville; Morris County Land Improvement Co., Whippany, and Houdaille Construction Materials, Inc. A small quantity of sand was used as engine and ballast sand. Pompton Crushed Stone Co., Riverdale; Alan Wood Steel Co., Mine Hill; and Wharton Sand & Stone Co., Wharton, quarried and crushed granite as riprap, concrete aggregates, road material, screenings, and stone sand. Logansville Pottery Co. (Basking Ridge) produced a small quantity of miscellaneous clay for use in manufacturing flowerpots. No peat production was reported in Morris County in 1956.

**Ocean.**—The mineral output of Ocean County was again limited to sand and gravel. Production was reported from pits operated by Brown & Burdge, Herbertsville; Ralph Clayton & Sons, Lakewood; J. Kalsch & Son, Straffordville; Clayton's Sand & Gravel, Inc., Barnegat; and North Jersey Quarry, Lakewood. The output was used mainly as building and paving material. New Jersey Pulverizing Co. (Pinewald) produced ground sand used for abrasives, filler, and foundry purposes.

**Passaic.**—Passaic County ranked second among the 11 stone-producing counties in New Jersey in 1956. Passaic quarries yielded basalt and miscellaneous stone; basalt was the more important. Crushed and broken miscellaneous stone for concrete, road material, and screenings was recovered at an open quarry belonging to Passaic Crushed Stone Co. (Pompton Lakes). The basalt output in Passaic County was used principally as concrete aggregate and road material. A substantial tonnage was sold to roofing-granule producers. Stone producers consisted of Samuel Braen & Sons, Haledon and Hawthorne; Consolidated Stone-Sand Co., Montclair Heights; Great Notch Corp., Great Notch; Sowerbutt Quarries, Inc., Prospect Park; and Union Building & Construction Corp., Clifton. Sand and gravel for structural purposes was produced in Passaic County by Samuel Braen's Sons, Pequannock; and H. J. Hinchman & Son, Van Orden Sand & Gravel Co., and Van Decker Bros., Inc., Paterson. The Paterson Brick Co., Inc. (near Little Falls) mined clay at an open pit, and the output of miscellaneous clay was used in producing heavy clay products. PerAlex of New Jersey, Inc., expanded perlite from material shipped from Western United States, at its Paterson plant.

Digitized by Google

Natural roofing granules were produced by H. B. Reed Corp. (Passaic) and Great Notch Granule Co. (Great Notch).

**Salem.**—A limited quantity of building sand was produced by A. W. Davis Lumber Co. (Salem). Floras S. Richman (Woodstown) reported an output of paving gravel.

**Somerset.**—The leading stone-producing county in New Jersey was again Somerset. Crushed and broken basalt as riprap, concrete aggregate, road material, and railroad ballast was produced by Fanwood Stone Crushing Quarry Co., Westfield; and Trap Rock Co., Kingston; North Jersey Quarry Co., Bound Brook and Millington; and Somerset Crushed Stone, Inc., Bernardsville. Basalt was the only type of stone recovered from quarries within the County. At an open-pit mine New Jersey Shale Brick & Tile Corp. near Somerville produced miscellaneous clay for use in heavy clay products. Peapack Limestone Quarry, Inc. (Peapack), did not produce in 1956 but planned to resume operations in 1957. Johns-Manville Corp. expanded perlite at its Manville plant from material purchased in Western United States. The company also manufactured from dolomite precipitated magnesium carbonate for use as insulation. Central Commercial Co., (Bound Brook) produced natural and artificially-colored roofing granules.

**Sussex.**—In terms of value, stone was the leading mineral commodity of the six minerals recovered from the mines, pits, and quarries of Sussex County. The open quarries of Limestone Products Corp. of America (Newton) and Farber White Limestone Co. (Franklin) yielded limestone for blast-furnace flux, concrete road material, rubber filler, and soil conditioner. The Sterling Hill mine of New Jersey Zinc Co. resumed operation September 4, 1956. The recovered manganiferous zinc ore yielded zinc and manganiferous residuum. Limestone Products Corp. of America operated its Lime Crest plant to produce hydrated lime. Output was sold for building, agricultural, water purification, and water-softening purposes. This company and F. W. Bennett & Son Co. (Sparta) also produced structural and paving sand and gravel. Hyper-Humus Co. (Andover) and Netcong Natural Products Co. (Stanhope) produced reed-sedge peat.

**Union.**—North Jersey Quarry Co.—operators of an open quarry, crusher, and mill near Summit—quarried and crushed basalt for use as concrete aggregate and roadstone. Loizeaux Builders Supply Co. produced a small quantity of sand for miscellaneous uses. Certified Industrial Products, Inc. (Hillside) expanded perlite from material produced in Western United States.

**Warren.**—Alan Wood Steel Co., at the Washington mine near Oxford, was the only producer of iron ore. Building and paving sand and gravel was produced by Portland Sand & Gravel Co. (Carpentersville) and Steckel Concrete Co. (Phillipsburg). The only marble-producing county in New Jersey in 1956 was Warren. The open quarry of The Royal Green Marble Co., Inc., near Phillipsburg yielded this commodity and the entire output was crushed for terrazzo. The Natco Corp. open-pit clay mine near Port Murray produced miscellaneous clay, which was used in heavy clay products. J. T. Baker Chemical Co. (Phillipsburg) produced a variety of magnesium compounds from oxides, carbonates, sulfates, and chlorides of magnesium.

Digitized by Google

# The Mineral Industry of New Mexico

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker[1]

NEW MEXICO'S mineral industry in 1956 was characterized by substantial increases in the output of petroleum, potash, copper, natural gas, natural-gas liquids, sand and gravel, manganese ore and concentrate, zinc, lead, helium, perlite, magnesium compounds, salt, silver, gold, and columbite-tantalite. Production of lime, rare earths, and vanadium in New Mexico was reported in 1956 for the first time. Decreases in the output of stone, molybdenum, coal, pumice, manganiferous ore and concentrate, sulfur, clays, carbon dioxide, barite, beryl, iron ore, and tungsten tended to offset the gains reported for other minerals.

Increases in production of petroleum and natural gas and of most metals and nonmetals raised the total value of New Mexico's mineral output to a new record of $513 million in 1956—a gain of $77 million over the $436 million (revised figure) total for 1955. However, a major portion of the increase was due to the inclusion, for the first time, of a value for uranium. The total value of mineral production in New Mexico has risen steadily since 1950, when it was $210 million, and the 1956 figure represents a 2½-fold increase in 6 years.

The value of the output of mineral fuels, including petroleum, natural gasoline, and liquefied-petroleum gases composed 67 percent of the total value of mineral production in the State. New Mexico continued to rank seventh among the States in petroleum production, and eight refineries were in operation; a large part of the crude-oil output was refined in other States.

Among the nonmetals, which contributed 17 percent of the total value of mineral production in New Mexico in 1956, potash was by far the most important. Both production and shipments established new records, and two new companies were constructing productive facilities in the Carlsbad-Hobbs region of southwestern New Mexico.

Metals contributed 20 percent of the total value of mineral production in 1956 compared with 13 percent in 1955. The gain in the value of the metal output was due to the inclusion of a value for uranium and production increases of 28 percent for copper, 93 percent for lead, and 150 percent for zinc, resulting from higher average prices for these metals.

Interest in uranium in 1956 reached a new peak in New Mexico, particularly in Valencia and McKinley Counties. According to the Atomic Energy Commission (AEC), New Mexico had 41 million tons of uranium reserves—two-thirds of the national total. Production increased significantly over 1955 largely owing to the full-scale operation of the Jackpile mine of The Anaconda Co. Development of the Ambrosia Lake district in McKinley County continued in 1956, but

[1]Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.



Digitized by Google

production remained small because extensive construction and development must precede actual mining.

Many New Mexico ores contain minor quantities of such precious metals as cadmium, bismuth, selenium, tellurium, and gallium. These quantities sometimes are unknown and sometimes although known by analyses, are not accounted for metallurgically in early processing stages. As it is impossible to distribute these mineral products by States of origin, their values are not included in the total value of the mineral output of New Mexico; however, the amount involved is small.

Of 9 Defense Minerals Exploration Administration (DMEA) contracts signed during the year, 8 were for uranium exploration in McKinley County and totaled $559,000. The steady growth of exploration for uranium under DMEA contracts is indicated by comparing the 1956 total with $127,000 in 1955 and $32,000 in 1954.

**TABLE 1.—Mineral production in New Mexico, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Barite | (2) | (2) | 4,059 | $81,180 |
| Beryllium concentrate—gross weight | 106 | $56,420 | 31 | (2) |
| Clays | 45,351 | 108,582 | 39,623 | 95,386 |
| Coal | 201,579 | 1,236,125 | 158,444 | 922,724 |
| Columbium-tantalum concentrates—pounds | 76 | 129 | 95 | 405 |
| Copper (recoverable content of ores, etc.) | 66,417 | 49,547,082 | 74,345 | 63,193,250 |
| Diatomite | (2) | (2) | | |
| Gem stones | (2) | 25,000 | (2) | 30,000 |
| Gold (recoverable content of ores, etc.)—troy ounces | 1,917 | 67,095 | 3,275 | 114,625 |
| Helium—thousand cubic feet | 53,721 | 946,447 | 76,072 | 1,350,194 |
| Iron ore (usable)—long tons, gross weight | 9,218 | (2) | (2) | (2) |
| Lead (recoverable content of ores, etc.) | 3,296 | 982,208 | 6,042 | 1,897,188 |
| Lime | | | 30,771 | 372,641 |
| Manganese ore and concentrate (35 percent or more Mn)—gross weight | 1,390 | (2) | 22,012 | 1,834,539 |
| Manganiferous ore and concentrate (5 to 35 percent Mn)—gross weight | 40,320 | (2) | 38,782 | 138,508 |
| Mica: | | | | |
| Sheet—pounds | 9,431 | 64,930 | 6,247 | 52,566 |
| Scrap | 84 | 2,475 | 767 | 22,213 |
| Natural gas—million cubic feet | 540,664 | 48,119,000 | 626,340 | 55,118,000 |
| Natural-gas liquids: | | | | |
| LP-gases—thousand gallons | 278,403 | 6,767,000 | 308,218 | 11,065,000 |
| Natural gasoline—do | 261,023 | 15,425,000 | 306,595 | 16,560,000 |
| Perlite | 147,805 | 1,091,250 | 167,705 | 1,270,993 |
| Petroleum (crude)—thousand 42-gallon barrels | 82,958 | 227,310,000 | 87,893 | 241,706,000 |
| Potassium salts—($K_2O$ equivalent) | [4] 1,841,122 | [4] 69,640,740 | 1,930,754 | 72,802,302 |
| Pumice | 393,597 | 780,339 | 292,330 | 667,146 |
| Salt | 49,738 | 596,780 | 57,156 | 501,040 |
| Sand and gravel | 4,556,447 | 6,004,554 | 6,054,500 | 5,775,900 |
| Silver (recoverable content of ores, etc.)—troy ounces | 251,072 | 227,233 | 392,967 | 355,656 |
| Stone | 1,573,441 | 1,546,665 | 1,268,235 | 1,271,837 |
| Tungsten concentrate—60-percent $WO_3$ basis | 1 | 3,036 | (5) | 1,586 |
| Zinc (recoverable content of ores, etc.) | 15,277 | 3,758,142 | 35,010 | 9,592,740 |
| Value of items that cannot be disclosed: Carbon dioxide (natural), fluorspar (1955), molybdenum, magnesium compounds, rare-earth-metals concentrate (1956), elemental sulfur, uranium ore (1956), vanadium (1956), and values indicated by footnote 2 | | 2,187,727 | | 26,600,893 |
| Total New Mexico | | [6] [7] 436,494,000 | | [7] 513,303,000 |

[1] Production, as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration purchase depots is excluded.

[2] Figure withheld to avoid disclosing individual company confidential data, included with, "Value of items that cannot be disclosed."

[3] Weight not recorded.

[4] Revised figure.

[5] Less than 1 ton.

[6] Figure excludes uranium; figure not released by Atomic Energy Commission.

[7] The total has been adjusted to eliminate duplication in the value of raw materials used in manufacturing

Digitized by Google

**TABLE 2.—Average unit value of selected mineral commodities in New Mexico, 1955–56 [1]**

| Commodity | | 1955 | 1956 |
|---|---|---|---|
| Clays | short ton | $2.394 | $2.407 |
| Coal | do. | 6.132 | 5.824 |
| Columbium-tantalum | pound | 1.697 | 4.263 |
| Copper [2] | do. | .373 | .425 |
| Gold [3] | troy ounce | 35.000 | 35.000 |
| Helium | thousand cubic feet | 17.618 | 17.749 |
| Lead [2] | pound | .149 | .157 |
| Mica: | | | |
| Sheet | do. | 6.885 | 8.415 |
| Scrap | short ton | 29.464 | 28.961 |
| Natural gas | thousand cubic feet | .089 | .088 |
| Natural-gas liquids: | | | |
| LP-gases | gallon | .024 | .036 |
| Natural gasoline | do. | .059 | .054 |
| Perlite (crude) | short ton | 7.383 | 7.579 |
| Petroleum [4] | 42-gallon barrel | 2.740 | 2.750 |
| Potassium salts | short ton | 37.825 | 37.707 |
| Pumice | do. | 1.983 | 2.282 |
| Salt | do. | 11.998 | 8.766 |
| Sand and gravel | do. | 1.318 | .954 |
| Silver [5] | troy ounce | .905+ | .905+ |
| Stone | short ton | .983 | 1.003 |
| Zinc [2] | pound | .123 | .137 |

[1] Based on average value f. o. b. mines or mills reported by the producers except as otherwise noted.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Value at wells.
[5] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505.

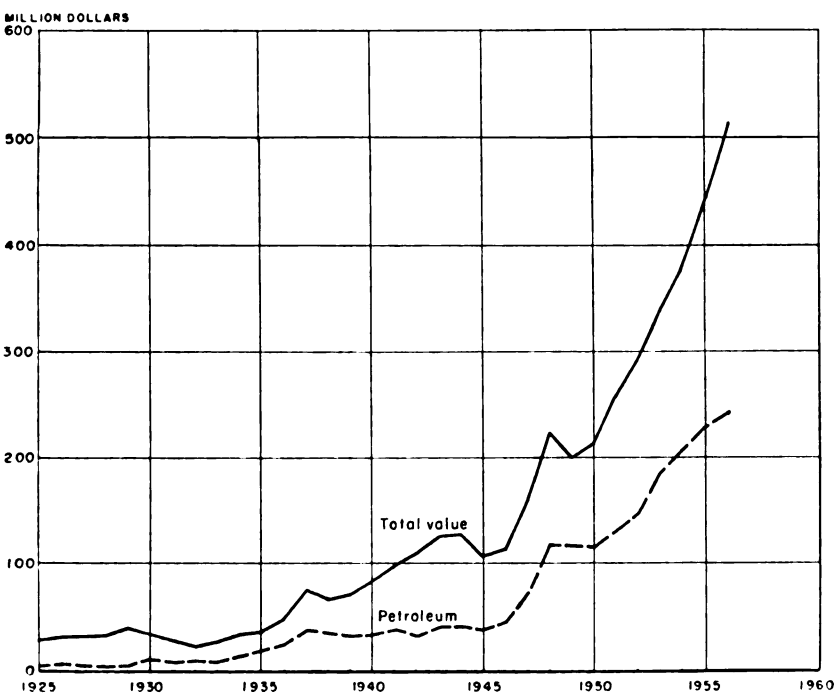



FIGURE 1.—Value of petroleum production and total value of all minerals produced in New Mexico, 1925–56.

Digitized by Google

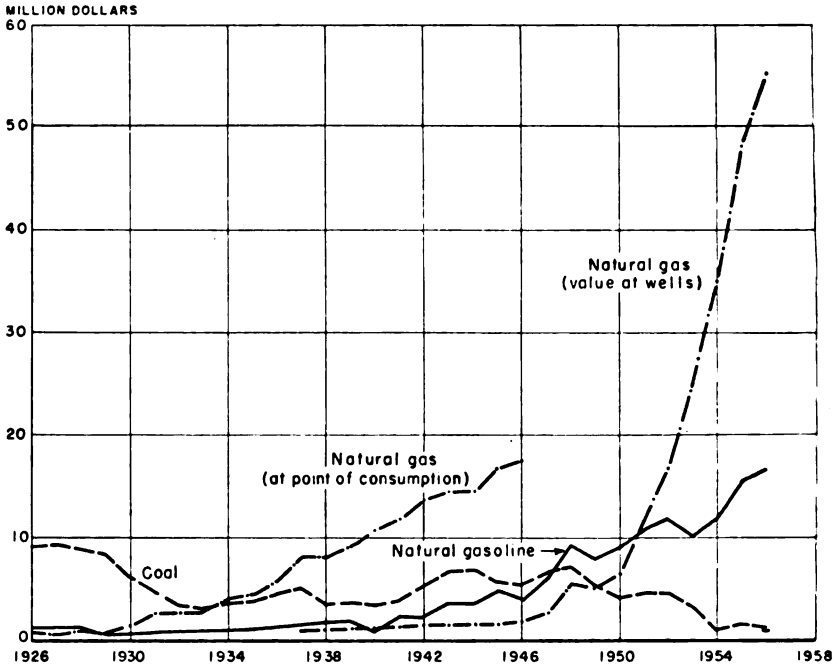



FIGURE 2.—Value of natural gas, natural gasoline, and coal produced in New Mexico, 1926–56.

**TABLE 3.—DMEA contracts executed in 1956**

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total amount | Government participation (percent) |
| MCKINLEY | | | | | |
| Colamer Corp. | Phyllis, Deeta, and Fannie claims. | Uranium | Apr. 9 | $102,580 | 75 |
| Food Machinery & Chemical Corp. | Sec. 7, T. 13 N., R. 9 W. | do. | Mar. 21 | 41,740 | 75 |
| Do. | Sec. 9, T. 13 N., R. 9 W. | do. | Mar. 21 | 71,928 | 75 |
| Do. | Sec. 29, T. 13 N., R. 9 W. | do. | Mar. 21 | 91,908 | 75 |
| Four Corners Exploration Co. | Divide claims | do. | Aug. 28 | 82,060 | 75 |
| Do. | Red Rock claims | do. | July 17 | 48,424 | 75 |
| Parador Mining Co., Inc. | Betty claims | do. | Mar. 9 | 45,580 | 75 |
| San Jacinto Petroleum Corp. | Secs. 32 and 36, T. 14 N., R. 9 W. | do. | Apr. 5 | 74,360 | 75 |
| SANTA FE | | | | | |
| Mercury Uranium & Oil Co. | San Pedro mine | Copper | July 27 | 105,300 | 60 |
| Total | | | | 663,880 | 71 |

Digitized by Google

## EMPLOYMENT AND INJURIES

All employment data contained in this section were obtained from publications of the Bureau of Labor Statistics, U. S. Department of Labor, and Employment and Security Commission of New Mexico. Mining employment covers exploration, development, mining, and processing minerals to a marketable product. Metals, nonmetals, and fuels, including petroleum, are covered.

New Mexico employed 2 percent of the total mining labor force of the United States in its mineral industry. The percentage relationship was static in 1955 and 1956, despite the shutdown of most copper and lead-zinc mines in the State. The exploration, development, and mining of uranium, coupled with the surge of drilling for oil and gas in Lea and Eddy Counties and in the San Juan basin of northwestern New Mexico, were responsible for the stability in the number of men employed in mining. As further evidence of the substitution of uranium, petroleum, and natural gas for copper, lead, and zinc as areas of employment, the total mining labor force rose from 14,900 men in 1952 to 16,000 in 1956, a gain of 8 percent.

No major disasters occurred in any New Mexico mineral industry in 1956; however, 9 fatalities were charged to the mining industry as the result of 7 accidents.

**TABLE 4.—Mining employment by types of mining, 1955–56**

[U. S. Department of Labor]

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Percent of total | Number of men | Percent of total | Number of men |
| Mining total | 100 | 14,800 | 100 | 16,100 |
| Metal mining | 26 | 3,800 | 27 | 4,300 |
| Petroleum and natural gas | 58 | 8,600 | 58 | 9,400 |
| Nonmetal and coal mining | 16 | 2,400 | 15 | 2,400 |

**TABLE 5.—Average hours and earnings of workers in selected industries, 1955–56[1]**

[U. S. Department of Labor]

| | Average weekly earnings | | Average weekly hours | | Average hourly earnings | |
|---|---|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 | 1955 | 1956 |
| Mining | $95.21 | $99.07 | 42.8 | 43.5 | $2.22 | $2.27 |
| Contract construction | 87.71 | 90.87 | 38.1 | 37.6 | 2.30 | 2.38 |
| Manufacturing | 80.90 | 85.80 | 40.5 | 41.1 | 2.00 | 2.11 |
| Commercial and utilities | 74.52 | 83.06 | 41.4 | 42.7 | 1.80 | 2.01 |
| Wholesale and retail trade | 62.12 | 62.79 | 41.9 | 41.3 | 1.48 | 1.52 |

[1] Excludes administrative and nonworking supervisory personnel. Average weekly earnings are gross amounts, including overtime, paid vacations, etc.

Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## METALS

**Beryllium.**—Output of beryl in New Mexico in 1956 was less than one-third that in 1955. In 1956, as in former years, the principal beryl-producing mine in the State and the United States was the Harding mine near Dixon, Taos County. The beryl, marketed at the Government purchase depot, Custer, S. Dak., was recovered from pegmatite by hand sorting. Andy Royball produced beryl in New Mexico and sold it to the Beryl Ores Co., Arvada, Colo.

**Columbium-Tantalum.**—Production of columbite-tantalite in New Mexico in 1956 came from a mine in Rio Arriba County operated by Columbium Milling & Mining Co., Inc. The material was sold to St. Anthony Mines, Lovelock, Nev.

**Copper.**—The output of copper in New Mexico in 1956 was 12 percent above 1955. The value of production increased 28 percent owing to the higher price for copper. The gain in output was due to the demand for copper at the beginning of the year that exceeded the supply. The United States producer's price advanced to 46 cents a pound late in February. By midyear the demand declined and the available supply was augmented by production from new mines, so that by the end of October the price fell to 36 cents a pound. The weighted average price for copper in 1956 was 42.5 cents a pound, compared with 37.3 cents in 1955.

**TABLE 6.—Principal custom mills, smelters, refineries, grinding plants, and brick plants in 1956**

| Name of operator or owner | County | Nearest city or town | Minerals processed | Remarks |
|---|---|---|---|---|
| Kinney Brick Co. | Bernalillo | Albuquerque | Clays | Produces building and face brick and structural clay and tile. |
| El Paso Brick Co. | Dona Ana | Brickland | do. | Do. |
| Kennecott Copper Corp. | Grant | Hurley | Copper | 400,000-ton-annual-charge capacity smelter. |
| American Smelting and Refining Co. | Luna | Deming | Copper, lead, and zinc ores. | 600-ton-a-day flotation mill. |
| Florida Manganese, Inc. | do. | do. | Manganese | Custom mill. |
| Peru Mining Co. | do. | do. | Copper, lead, and zinc ores. | 1,250-ton-a-day flotation mill. |
| Gallup Brick & Tile Co. | McKinley | Gallup | Clays | Produces building and face brick and structural clay and tile. |
| Petaca Mining Corp. | Rio Arriba | Petaca | Mica | Dry grinding mill. |
| Kerr-McGee Oil Industries, Inc. | San Juan | Shiprock | Uranium | 50-ton-a-day rated capacity. |
| Santa Fe Mica Co. | Santa Fe | Santa Fe | Mica | Dry grinding mill. |
| James H. Rhodes Pumice, Inc. | do. | do. | Pumice | Do. |
| Ambrosia Minerals, Inc. | Socorro | Socorro | Manganese | Custom mill. |
| Birchfield Mining Co. | do. | do. | do. | Do. |
| The Anaconda Co. | Valencia | Bluewater | Uranium | 3,000-ton-a-day rated capacity. |

Digitized by Google

**TABLE 7.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1848–1956, in terms of recoverable metals [1]**

| Year | Mines producing | | Material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 82 | 3 | 7,639,051 | 3,436 | $120,274 | 443,242 | $401,151 |
| 1952 | 66 | 1 | 9,120,841 | 2,949 | 103,215 | 479,318 | 433,807 |
| 1953 | 55 | 2 | 8,070,056 | 2,614 | 91,490 | 205,309 | 185,815 |
| 1954 | 37 | 4 | 6,763,529 | 3,539 | 123,865 | 109,132 | 98,770 |
| 1955 | 50 | 6 | 7,446,772 | 1,917 | 67,095 | 251,072 | 227,233 |
| 1956 | 75 | 1 | 8,751,559 | 3,275 | 114,625 | 392,967 | 355,655 |
| 1848–1956 | | | [3] | 2,214,311 | 50,835,078 | 71,408,739 | 56,252,234 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 66,028 | $28,541,200 | 5,737 | $1,838,265 | 37,927 | $10,766,695 | $41,667,585 |
| 1952 | 76,112 | 36,838,208 | 7,021 | 2,260,762 | 50,975 | 16,923,700 | 56,559,692 |
| 1953 | 72,477 | 41,601,798 | 2,943 | 771,066 | 13,373 | 3,075,790 | 45,725,959 |
| 1954 | 60,558 | 35,729,220 | 887 | 243,038 | 6 | 1,296 | 36,196,189 |
| 1955 | 66,417 | 49,547,082 | 3,296 | 982,208 | 15,277 | 3,758,142 | 54,581,760 |
| 1956 | 74,345 | 63,193,250 | 6,042 | 1,897,188 | 35,010 | 9,592,740 | 75,153,458 |
| 1848–1956 | 2,030,246 | 768,044,277 | 323,714 | 43,901,487 | 1,149,214 | 213,213,334 | 1,132,246,410 |

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore, old tailings, old slag, or copper precipitates shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed or tonnage of precipitates shipped.
[3] Figure not available.

**TABLE 8.—Gold and silver produced at placer mines, 1947–51 (average) and 1952–56, in terms of recoverable metals**

| Year | Gold | | Silver | | Total value | Year | Gold | | Silver | | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fine ounces | Value | Fine ounces | Value | | | Fine ounces | Value | Fine ounces | Value | |
| 1947–51 (ave.) | 15 | $511 | 4 | $4 | $515 | 1954 | 14 | $490 | | | $490 |
| 1952 | 2 | 70 | | | 70 | 1955 | 81 | 2,835 | 10 | $9 | 2,844 |
| 1953 | 5 | 175 | 2 | 2 | 177 | 1956 | 2 | 70 | | | 70 |

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 92 | 26,615 | 6,497 | 386 | 2,394 |
| February | 214 | 27,248 | 6,515 | 336 | 2,474 |
| March | 207 | 31,649 | 7,349 | 425 | 2,956 |
| April | 154 | 30,453 | 6,016 | 446 | 2,787 |
| May | 201 | 33,030 | 6,670 | 463 | 3,005 |
| June | 444 | 29,319 | 5,779 | 398 | 2,922 |
| July | 361 | 31,386 | 6,318 | 458 | 3,110 |
| August | 700 | 53,477 | 6,352 | 803 | 3,375 |
| September | 267 | 30,032 | 5,572 | 525 | 3,172 |
| October | 235 | 34,625 | 5,511 | 616 | 3,508 |
| November | 188 | 33,321 | 5,664 | 584 | 2,632 |
| December | 212 | 31,812 | 6,102 | 602 | 2,675 |
| Total | 3,275 | 392,967 | 74,345 | 6,042 | 35,010 |

Digitized by Google

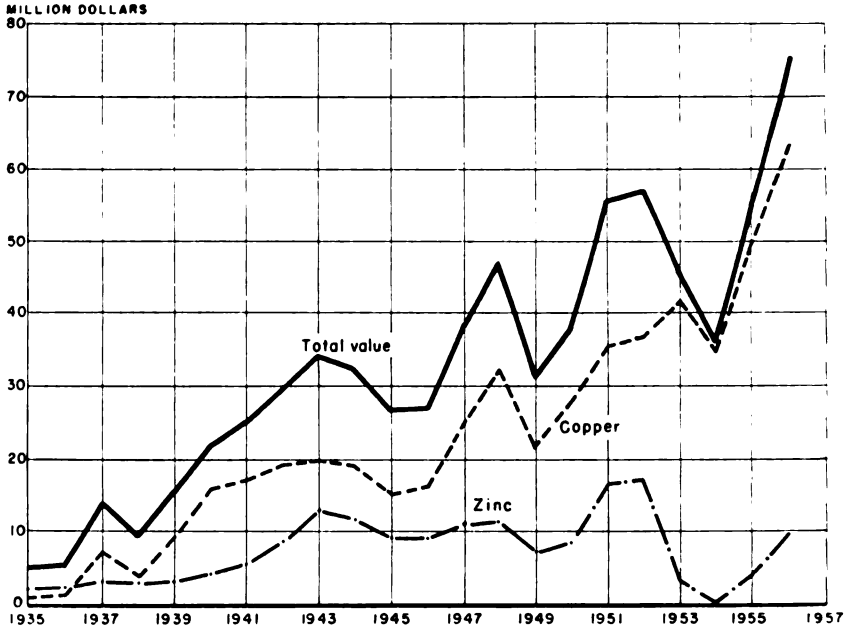



FIGURE 3.—Total value of gold, silver, copper, lead, and zinc in New Mexico and value of mine production of copper and zinc, 1935–56.

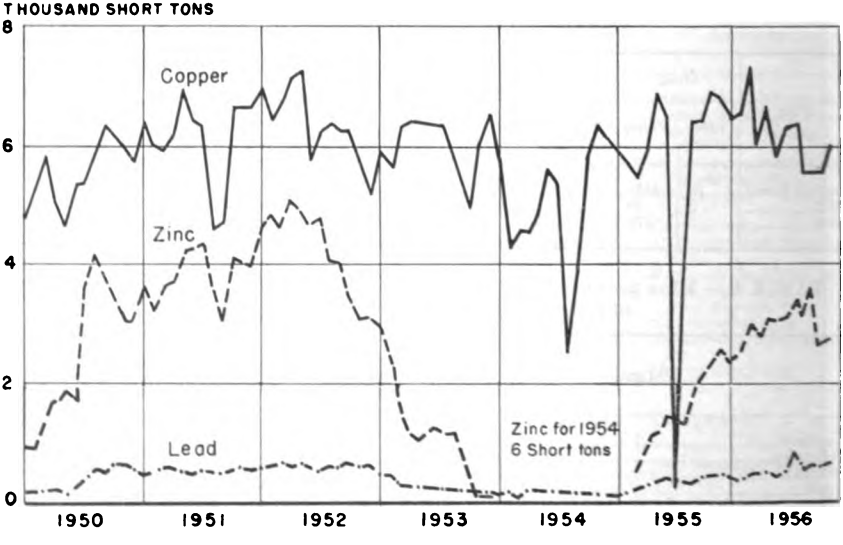



FIGURE 4.—Mine production of copper, lead, and zinc in New Mexico, by months, 1950–56, in terms of recoverable metals.

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956 [1] by counties and districts, in terms of recoverable metals**

| County and district | Mines producing (lode and placer) [2] | Material sold or treated (short tons) [2] | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|
| | | | Fine ounces | Value | Fine ounces | Value |
| Eddy County | 1 | 349 | | | | |
| Grant County: Burro Mountain | 4 | 1,581 | 9 | $315 | 348 | $315 |
| Central | 8 | 8,570,011 | 2,306 | 80,710 | 259,575 | 234,928 |
| Eureka | 1 | 900 | 4 | 140 | 2,601 | 2,354 |
| Pinos Altos [4] | 1 | | 2 | 70 | | |
| Steeple Rock and Swartz [5] | 3 | 3,897 | 186 | 6,510 | 13,422 | 12,148 |
| Total | 17 | 8,576,389 | 2,507 | 87,745 | 275,946 | 249,745 |
| Guadalupe County: Pintado | 2 | 24,621 | | | | |
| Hidalgo County: | | | | | | |
| Apache | 1 | 50 | | | 85 | 77 |
| Lordsburg | 3 | 88,142 | 543 | 19,005 | 60,699 | 54,936 |
| Total | 4 | 88,192 | 543 | 19,005 | 60,784 | 55,013 |
| Luna County: | | | | | | |
| Cooks Peak | 1 | 14 | | | 101 | 91 |
| Florida Mountains | 1 | 35 | | | 29 | 26 |
| Tres Hermanas | 2 | 92 | | | 97 | 88 |
| Total | 4 | 141 | | | 227 | 205 |
| Mora County | 2 | 44 | | | 1 | 1 |
| Otero County: | | | | | | |
| Sacramento | 3 | 213 | | | 68 | 62 |
| Tularosa | 1 | 75 | | | | |
| Total | 4 | 288 | | | 68 | 62 |
| Rio Arriba County: Cuba (Nacimiento Mountains) | 3 | 11,168 | | | 7,231 | 6,544 |
| Sandoval County: Cuba (Nacimiento Mountains) | 2 | 1,735 | | | 333 | 301 |
| Santa Fe County: | | | | | | |
| Cerrillos and San Pedro (New Placers) [5] | 4 | 1,363 | 112 | 3,920 | 2,890 | 2,616 |
| Cooper (Pecos) | 1 | 149 | | | 63 | 57 |
| Total | 5 | 1,512 | 112 | 3,920 | 2,953 | 2,673 |
| Sierra County: | | | | | | |
| Chloride | 3 | 79 | | | 50 | 45 |
| Hermosa | 1 | 20 | | | 323 | 292 |
| Kingston | 3 | 748 | 56 | 1,960 | 6,585 | 5,960 |
| Pittsburg and Tierra Blanca [5] | 4 | 27 | 3 | 105 | 29 | 27 |
| Total | 11 | 874 | 59 | 2,065 | 6,987 | 6,324 |
| Socorro County: | | | | | | |
| Hansonberg | 2 | 28,592 | | | 3,029 | 2,741 |
| Magdalena | 12 | 17,273 | 53 | 1,855 | 35,353 | 31,996 |
| Scholle Area | 1 | 39 | | | | |
| Silver Mountain (Water Canyon) | 1 | 3 | | | 13 | 12 |
| Total | 16 | 45,907 | 53 | 1,855 | 38,395 | 34,749 |
| Taos County: Red River | 1 | 15 | | | | |
| Torrance County: Carocito | 1 | 146 | | | 17 | 15 |
| Union County | 1 | 4 | | | 10 | 9 |
| Valencia County: | | | | | | |
| Hell's Canyon | 1 | 55 | 1 | 35 | 4 | 4 |
| Rio Puerco | 1 | 119 | | | 11 | 10 |
| Total | 2 | 174 | 1 | 35 | 15 | 14 |
| Total New Mexico | 76 | 8,751,559 | 3,275 | 114,625 | 392,967 | 355,655 |

See footnotes at end of table.

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956 [1] by counties and districts, in terms of recoverable metals—Continued**

| County and district | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Pounds | Value | Pounds | Value | Pounds | Value | |
| Eddy County | 13,200 | $5,610 | | | | | $5,610 |
| Grant County: | | | | | | | |
| Burro Mountain | 17,600 | 7,480 | 1,000 | $157 | | | 8,297 |
| Central | 142,432,700 | 60,533,897 | 9,364,300 | 1,470,195 | 67,262,800 | $9,215,003 | 71,534,733 |
| Eureka | 700 | 298 | 47,700 | 7,489 | 71,400 | 9,782 | 20,063 |
| Pinos Altos [4] | | | | | | | 70 |
| Steeple Rock and Swartz [4] | 4,600 | 1,955 | 248,500 | 39,014 | 399,400 | 54,718 | 114,345 |
| Total | 142,455,600 | 60,543,630 | 9,661,500 | 1,516,855 | 67,733,600 | 9,279,503 | 71,677,478 |
| Guadalupe County: Pintado | 1,274,300 | 541,577 | | | | | 541,577 |
| Hidalgo County: | | | | | | | |
| Apache | 3,500 | 1,488 | | | | | 1,565 |
| Lordsburg | 4,240,500 | 1,802,212 | 37,400 | 5,872 | | | 1,882,025 |
| Total | 4,244,000 | 1,803,700 | 37,400 | 5,872 | | | 1,883,590 |
| Luna County: | | | | | | | |
| Cooks Peak | | | 9,300 | 1,460 | | | 1,551 |
| Florida Mountains | 2,000 | 850 | | | | | 876 |
| Tres Hermanas | 100 | 43 | | | | | 131 |
| Total | 2,100 | 893 | 9,300 | 1,460 | | | 2,558 |
| Mora County | 1,600 | 680 | | | | | 681 |
| Otero County: | | | | | | | |
| Sacramento | 4,700 | 1,997 | 5,800 | 911 | | | 2,970 |
| Tularosa | 1,100 | 468 | | | | | 468 |
| Total | 5,800 | 2,465 | 5,800 | 911 | | | 3,438 |
| Rio Arriba County: Cuba (Nacimiento Mountains) | 502,500 | 213,563 | | | | | 220,107 |
| Sandoval County: Cuba (Nacimiento Mountains) | 45,700 | 19,423 | | | | | 19,724 |
| Santa Fe County: | | | | | | | |
| Cerrillos and San Pedro (New Placers) [4] | 45,900 | 19,507 | 105,700 | 16,595 | 156,200 | 21,399 | 64,037 |
| Cooper (Pecos) | 8,500 | 3,613 | | | | | 3,670 |
| Total | 54,400 | 23,120 | 105,700 | 16,595 | 156,200 | 21,399 | 67,707 |
| Sierra County: | | | | | | | |
| Chloride | 500 | 212 | 2,100 | 330 | 1,500 | 206 | 793 |
| Hermosa | | | 2,700 | 424 | 900 | 123 | 839 |
| Kingston | 10,200 | 4,335 | 55,700 | 8,745 | 66,300 | 9,083 | 30,083 |
| Pittsburg and Tierra Blanca [4] | 800 | 340 | 1,500 | 235 | | | 707 |
| Total | 11,500 | 4,887 | 62,000 | 9,734 | 68,700 | 9,412 | 32,422 |
| Socorro County: | | | | | | | |
| Hansonberg | | | 826,200 | 129,713 | | | 132,454 |
| Magdalena | 65,200 | 27,709 | 1,376,100 | 216,048 | 2,061,500 | 282,426 | 560,634 |
| Scholle Area | 900 | 383 | | | | | 383 |
| Silver Mountain (Water Canyon) | 100 | 43 | | | | | 55 |
| Total | 66,200 | 28,135 | 2,202,300 | 345,761 | 2,061,500 | 282,426 | 692,926 |
| Taos County: Red River | 400 | 170 | | | | | 170 |
| Torrance County: Carocito | 4,600 | 1,955 | | | | | 1,970 |
| Union County | 800 | 340 | | | | | 349 |
| Valencia County: | | | | | | | |
| Hell's Canyon | 2,000 | 850 | | | | | 889 |
| Rio Puerco | 5,300 | 2,252 | | | | | 2,262 |
| Total | 7,300 | 3,102 | | | | | 3,151 |
| Total New Mexico | 148,690,000 | 63,193,250 | 12,084,000 | 1,897,188 | 70,020,000 | 9,592,740 | 75,153,458 |

[1] The report of this series for 1929 (Mineral Resources of the United States, 1929, pt. 1, pp. 729–759) gives the yearly production of each important metal-producing district in New Mexico from 1904 to 1929, inclusive. Subsequent records, year by year, may be found in annual issues of Mineral Resources and Minerals Yearbook.

[2] All lode mines except for 1 placer mine in Pinos Altos district.

[3] Does not include gravel washed or tonnage of precipitates shipped.

[4] Placer production.

[5] Combined to avoid disclosing individual company confidential data.

Digitized by Google

**TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore and other source materials, in terms of recoverable metals**

| Source | Number of mines[1] | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Lode ore: | | | | | | | |
| Dry gold | 4 | 200 | 30 | 73 | 2,000 | ---------- | ---------- |
| Dry gold-silver | 4 | 3,957 | 368 | 19,245 | 54,200 | 9,200 | ---------- |
| Dry silver | 17 | 13,556 | -------- | 9,183 | 560,600 | 2,100 | ---------- |
| Total | 25 | 17,713 | 398 | 28,501 | 616,800 | 11,300 | ---------- |
| Copper [2] | 27 | 8,250,490 | 1,890 | 79,337 | 113,490,000 | 1,800 | ---------- |
| Copper-lead | 1 | 1,368 | 35 | 3,331 | 23,900 | 28,200 | ---------- |
| Copper-lead-zinc | 1 | 91,011 | 576 | 33,014 | 2,062,000 | 1,671,500 | 5,996,300 |
| Copper-zinc | 1 | 71 | -------- | 182 | 8,700 | ---------- | 6,700 |
| Lead [3] | 16 | 29,485 | 29 | 5,215 | 8,000 | 1,020,400 | 28,300 |
| Lead-zinc | 13 | 114,479 | 244 | 180,512 | 746,200 | 7,489,400 | 30,338,500 |
| Zinc | 2 | 246,942 | 101 | 62,875 | 206,200 | 1,861,400 | 33,650,200 |
| Total | 57 | 8,733,846 | 2,875 | 364,466 | 116,542,000 | 12,072,700 | 70,020,000 |
| Other "lode" material: Copper precipitates [4] | 2 | 19,824 | -------- | -------- | 31,531,200 | ---------- | ---------- |
| Total "lode" material | 75 | 8,771,383 | 3,273 | 392,967 | 148,690,000 | 12,084,000 | 70,020,000 |
| Gravel (placer operation) | 1 | ---------- | 2 | -------- | ---------- | ---------- | ---------- |
| Total, all sources | 76 | 8,771,383 | 3,275 | 392,967 | 148,690,000 | 12,084,000 | 70,020,000 |

[1] Detail will not necessarily add to totals because some mines produce more than 1 class of material.
[2] Includes 137,500 tons of newly mined ore treated by heap and vat leaching, yielding 147,100 pounds of copper.
[3] Includes 26,839 tons of lead-barite ore yielding 536 tons of lead concentrate, averaging 70 percent lead, and 4,059 tons of barite.
[4] Excludes 103 tons of precipitates recovered from newly mined ore treated by leaching. See footnote 2.

**TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals**

| Type of material processed and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Amalgamation [1] | 24 | 8 | ---------- | ---------- | ---------- |
| Concentration, and smelting of concentrates [1] | 2,769 | 360,033 | 114,180,200 | 11,879,600 | 69,990,800 |
| Direct-smelting: | | | | | |
| Ore | 480 | 32,926 | 2,978,600 | 204,400 | 29,200 |
| Copper precipitates | ---------- | ---------- | 31,531,200 | ---------- | ---------- |
| Total | 480 | 32,926 | 34,509,800 | 204,400 | 29,200 |
| Placer | 2 | ---------- | ---------- | ---------- | ---------- |
| Grand total | 3,275 | 392,967 | 148,690,000 | 12,084,000 | 70,020,000 |

[1] Ore only; no old tailings, etc., processed by this method in 1956.

Digitized by Google

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals**

*A. For ore treated at mills*

| | Ore treated (short tons) | Recoverable in bullion | | Concentrate shipped to smelters and recoverable metals | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Concentrate (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | | | | |
| Grant [1] | 8,519,667 | | | 299,118 | 2,310 | 264,231 | 109,958,900 | 9,659,500 | 67,733,600 |
| Hidalgo | 86,139 | | | 7,846 | 421 | 57,144 | 4,186,200 | 28,200 | |
| Santa Fe | 793 | 21 | 7 | 239 | 11 | 1,982 | 2,400 | 99,600 | 156,200 |
| Sierra | 553 | 3 | 1 | 120 | 4 | 1,940 | 3,500 | 57,100 | 67,900 |
| Socorro [2] | 44,555 | | | 3,594 | 23 | 34,736 | 29,200 | 2,035,200 | 2,033,300 |
| Total: 1956 | 8,651,707 | 24 | 8 | 310,917 | 2,769 | 360,033 | 114,180,200 | 11,879,600 | 69,990,800 |
| 1955 | 7,354,983 | 36 | 11 | 232,625 | 1,204 | 201,451 | 106,962,441 | 6,447,960 | 30,525,000 |
| **BY CLASSES OF ORE TREATED** | | | | | | | | | |
| Dry Gold | 104 | 24 | 8 | | | | | | |
| Copper [1] | 8,169,113 | | | 228,049 | 1,813 | 77,140 | 111,133,200 | | |
| Copper-lead | 1,368 | | | 70 | 35 | 3,331 | 23,900 | 28,200 | |
| Copper-lead-zinc | 91,011 | | | 10,555 | 576 | 33,014 | 2,062,000 | 1,671,500 | 5,996,300 |
| Copper-zinc | 71 | | | 25 | | 182 | 8,700 | | 6,700 |
| Lead [2] | 28,627 | | | 598 | | 3,065 | | 830,100 | |
| Lead-zinc | 114,471 | | | 35,417 | 244 | 180,426 | 746,200 | 7,488,400 | 30,337,600 |
| Zinc | 246,942 | | | 36,203 | 101 | 62,875 | 206,200 | 1,861,400 | 33,650,200 |
| Total: 1956 | 8,651,707 | 24 | 8 | 310,917 | 2,769 | 360,033 | 114,180,200 | 11,879,600 | 69,990,800 |
| **BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS** | | | | | | | | | |
| Copper | | | | 232,088 | 2,203 | 87,589 | 113,103,200 | 24,000 | |
| Copper-lead | | | | 34 | 4 | 1,490 | 3,900 | 34,700 | 300 |
| Copper-lead-zinc | | | | 5,389 | 165 | 108,102 | 277,600 | 5,487,500 | 934,700 |
| Copper-zinc | | | | 9 | | 34 | 600 | 400 | 9,400 |
| Lead | | | | 4,642 | 245 | 104,073 | 98,200 | 5,589,600 | 365,300 |
| Zinc | | | | 68,755 | 152 | 58,745 | 696,700 | 743,400 | 68,681,100 |
| Total: 1956 | | | | 310,917 | 2,769 | 360,033 | 114,180,200 | 11,879,600 | 69,990,800 |

See footnotes at end of table.

Digitized by Google

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued**

*B. For material shipped directly to smelters*

| | Material shipped (short tons) | Recoverable metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | |
| Eddy | 349 | | | 13,200 | | |
| Grant | 76,546 | 195 | 11,715 | 32,496,700 | 2,000 | |
| Guadalupe | 24,621 | | | 1,274,300 | | |
| Hidalgo | 2,053 | 122 | 3,640 | 57,800 | 9,200 | |
| Luna | 141 | | 227 | 2,100 | 9,300 | |
| Mora | 44 | | 1 | 1,600 | | |
| Otero | 288 | | 68 | 5,800 | 5,800 | |
| Rio Arriba | 11,168 | | 7,231 | 502,500 | | |
| Sandoval | 1,735 | | 333 | 45,700 | | |
| Santa Fe | 719 | 80 | 964 | 52,000 | 6,100 | |
| Sierra | 321 | 52 | 5,046 | 8,000 | 4,900 | 900 |
| Socorro | 1,352 | 30 | 3,659 | 37,000 | 167,100 | 28,300 |
| Taos | 15 | | | 400 | | |
| Torrance | 146 | | 17 | 4,600 | | |
| Union | 4 | | 10 | 800 | | |
| Valencia | 174 | 1 | 15 | 7,300 | | |
| Total: 1956 | 119,676 | 480 | 32,926 | 34,509,800 | 204,400 | 29,200 |
| 1955 | 107,010 | 596 | 49,600 | 25,871,559 | 144,040 | 29,000 |
| **BY CLASSES OF MATERIAL** | | | | | | |
| Dry gold: Crude ore | 96 | 6 | 65 | 2,000 | | |
| Dry gold-silver: Crude ore | 3,957 | 368 | 19,245 | 54,200 | 9,200 | |
| Dry silver: Crude ore | 13,556 | | 9,183 | 560,600 | 2,100 | |
| Copper: | | | | | | |
| Crude ore | 81,377 | 77 | 2,197 | 2,356,800 | 1,800 | |
| Precipitates [3] | 19,824 | | | 31,531,200 | | |
| Lead: Crude ore | 858 | 29 | 2,150 | 5,000 | 100,300 | 28,300 |
| Lead-zinc: Crude ore | 8 | | 86 | | 1,000 | 900 |
| Total: 1956 | 119,676 | 480 | 32,926 | 34,509,800 | 204,400 | 29,200 |

[1] Includes 137,500 tons of newly mined ore treated by heap and vat leaching, yielding 147,100 pounds of copper.
[2] Includes 26,839 tons of lead-barite ore yielding 536 tons of lead concentrate, averaging 70 percent lead, and 4,059 tons of barite.
[3] Excludes 103 tons of precipitates recovered from newly mined ore treated by heap and vat leaching. See footnote 1.



Digitized by Google

**TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content**

| Class of material | Material shipped or treated (short tons) | Gross metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **CONCENTRATE SHIPPED TO SMELTERS** | | | | | | |
| Copper | 232,088 | 6,493 | 154,880 | [1]114,967,080 | 40,050 | ---- |
| Copper-lead | 34 | 4 | 1,490 | 4,883 | 35,413 | 421 |
| Copper-lead-zinc | 5,389 | 165 | 108,102 | 347,026 | 5,599,469 | 1,198,293 |
| Copper-zinc | 9 | ---- | 39 | 709 | 507 | 10,416 |
| Lead | 4,642 | 245 | 104,073 | 147,707 | 5,703,374 | 468,935 |
| Zinc | 68,755 | 507 | 98,469 | 1,411,122 | 1,179,405 | 76,864,478 |
| Total: 1956 | 310,917 | 7,414 | 467,053 | [1]116,878,527 | 12,558,218 | 78,542,543 |
| 1955 | 232,625 | 7,275 | 281,268 | 109,306,919 | 6,629,528 | 34,049,557 |
| **ORE, ETC., SHIPPED DIRECTLY TO SMELTERS** | | | | | | |
| Dry gold: Crude ore | 96 | 6 | 65 | 2,058 | ---- | ---- |
| Dry gold-silver: Crude ore | 3,957 | 368 | 19,245 | 55,892 | 15,381 | ---- |
| Dry silver: Crude ore | 13,556 | ---- | 9,183 | 578,131 | 3,381 | ---- |
| Copper: | | | | | | |
| Crude ore | 81,377 | 136 | 2,837 | 2,635,177 | 3,078 | ---- |
| Precipitates [2] | 19,824 | ---- | ---- | 31,875,019 | ---- | ---- |
| Lead: Crude ore | 858 | 29 | 2,150 | 6,446 | 194,492 | 36,194 |
| Lead-zinc: Crude ore | 8 | ---- | 86 | 18 | 1,021 | 1,098 |
| Total: 1956 | 119,676 | 539 | 33,566 | 35,152,741 | 217,353 | 37,292 |
| 1955 | 107,010 | 662 | 50,282 | 26,717,590 | 162,537 | 39,022 |

[1] Includes 151,700 pounds of copper contained in 103 tons of precipitates obtained from newly mined ore treated by heap and vat leaching.
[2] Excludes 103 tons obtained from newly mined ore treated by heap and vat leaching.

Most of the gain in output of copper in New Mexico in 1956 was due to increased production from the Chino open-pit mine of the Kennecott Copper Corp., the State's outstanding producer. Output from the Miser's Chest mine, operated by Banner Mining Co., the second largest producer of copper in the State for many years, was about the same in 1956 as in 1954 and 1955. Other substanital producers of copper were the Bayard mines operated by the United States Smelting Refining and Mining Co. and the Stauber mine operated by the Drusan Mining Co.

**Gold.**—In 1956 gold production in New Mexico rose from the lowest figure on record, that of 1955, to virtually the same level as in 1954. Most of the increase in 1956 came from the Chino Mines Division, Kennecott Copper Corp., and was due to an increase in the output of blister copper (from which gold was recovered as a byproduct during electrolytic refining) and a reduction in output of fire-refined copper (from which no gold is recovered). The output of blister copper increased when the demand for fire-refined copper diminished and the corporation had to place its copper fire refinery on a standby basis.

**Iron Ore.**—Iron ore for use in cement was mined in 1956 from the Hanover-Bessemer's Pearson iron pit in Grant County by White & Mathis. Magnetite Products Corp. mined iron ore from the Ferro Iron Mines, Inc., pit in Lincoln County for use in coating underwater pipelines and transmission lines. This special pipe weighed 4.25

Digitized by Google

times the weight of water. All iron ore mined and used was magnetite.

**Lead.**—Lead output in New Mexico rose from 3,296 tons in 1955 to 6,042 tons in 1956, an 83-percent increase. The value of output increased more (93 percent) because of the higher average weighted price—15.7 cents a pound in 1956 compared with 14.9 cents in 1955. Most of the increased output was due to the stimulus to mining of the increased price for lead.

The bulk (71 percent) of the State's lead output was recovered as a byproduct or coproduct from complex base-metal ores from 3 mines. The leading producer was the Ground Hog Unit mines of the American Smelting and Refining Co., which resumed operations in March 1955 after being idle since February 1953. The United States Smelting Refining and Mining Co. Bayard mines, operated by lessees, ranked second in lead output. The third-ranking producer was the Lynchburg mines owned by The New Jersey Zinc Co. The lead was recovered from lead-zinc ore from the Ground Hog and Lynchburg mines and copper-lead-zinc ore from the Bayard mines.

Other mines reopened late in 1955 that recovered lead (as a byproduct of zinc ore mined) were the Hanover zinc mine operated by The New Jersey Zinc Co. and the Kearney zinc mine operated by New Mexico Consolidated Mining Co.

**Manganese.**—Shipments of manganese ore and concentrate from New Mexico increased from 1,390 tons in 1955 to 22,012 short tons (gross weight) in 1956. Thirteen individuals and companies shipped ore and concentrate from deposits in Hidalgo, Luna, Sandoval, and Socorro Counties to the Government General Services Administration (GSA), purchase depot under the "carlot" program that required a minimum manganese content of 40 percent. Nine operations iy Socorro County shipped 89 percent of the State total.

Manganiferous ore (ferruginous manganese ore containing 10.5 percent manganese and 35 to 38 percent iron) was mined in 1956 from the Boston Hill deposit by the Luck Mining & Construction Co. and shipped to the Colorado Fuel & Iron Corp. for use in making steel at its Pueblo (Colo.) plant. The output was slightly below that in 1955.

**Molybdenum.**—Molybdenum concentrate recovered as a byproduct of copper ore mined from the Chino open-pit mine in Grant County by Kennecott Copper Corp. and milled at Hurley continued to be the major source of molybdenum in New Mexico in 1956. The Questa molybdenum mine, 6 miles east of Questa in Taos County, also continued to be an important producer of molybdenum concentrate in the State in 1956.

**Rare-Earth Metals.**—Owing to fluctuations in market price and erratic demand, the rare-earth-mineral industry in New Mexico remained relatively static in 1956. The sale of combined rare-earth oxides recovered from the treatment of bastnaesite ores by the New Mexico Copper Corp. was reported; however, the mill at Carrizozo, recently revamped to recover rare earths, was idle most of the year.

**Silver.**—Output of silver in New Mexico in 1956, recovered mainly as a byproduct of ores of copper, lead, and zinc, increased 57 percent over 1955. This increase was due primarily to reopening of a number of lead-zinc and zinc mines late in 1955 and early in 1956. The leading silver producer in the State in 1956, as in 1955, was the Ground

Digitized by Google

Hog Unit mines. Other mines producing substantial quantities of silver, in order of output, were Miser's Chest, Kearney, Bayard, Lynchburg, Hanover, and Chino.

**Tungsten.**—The two operations that produced tungsten concentrate in New Mexico in 1955 also supplied the entire output in 1956. David D. Osmer mined ore from the Morning Star mine in Grant County and D. H. Abel & W. V. Westfall operated the Wichita group in Taos County.

**Uranium.**—New Mexico's leading position with respect to domestic uranium-ore reserves was formally established in December with announcement by the Atomic Energy Commission (AEC) of the Nation's uranium reserves.[2]

As of November 1, 1956, the State was credited with 41 million tons of measured, indicated, and inferred ore—two-thirds of the national total. Average grade of the reserves was 0.24 percent (4.8 pounds contained $U_3O_8$ per ton). All but a small portion of the reserves lay in the Ambrosia Lake district (McKinley County) and the Laguna district (Valencia County).

Private drilling increased over the preceding year. Much of the work was done on Ambrosia Lake ore bodies, which required careful and detailed examination because of their depth and the high capital expenditures necessary for exploitation.

During the first 6 months of the year ore was shipped from 41 properties. Total tonnage for the 6-months period increased several-fold over shipments in the last 6 months of 1955. Continuous operation of the Jackpile mine was primarily responsible for the increase. Valencia and McKinley Counties produced over 90 percent of the total output; the remainder came from Socorro, San Juan, and Rio Arriba Counties.

Production from the Ambrosia Lake district was small, as several years of construction and development work were necessary before the district could be fully exploited. At the close of 1956 only the Dysart shaft of Rio de Oro Uranium Mines, Inc., had been sunk to the ore horizon.

Milling capacity at the Bluewater and Shiprock uranium mills continued to increase, as the Bluewater acid-leach plant went into full production and alterations were made at Shiprock. Capacity to process ore at these 2 plants was 3,500 tons a day in December. In the spring, the AEC established a temporary station between Grants and Bluewater in Valencia County to purchase ores from the Grants area. Previously these ores had gone to the Anaconda plant at Bluewater. The buying station is to be maintained until new mills have been constructed to treat Ambrosia Lake ore.

**Vanadium.**—Many New Mexico uranium ores contain vanadium; however, except for some ores in western San Juan County and at one property in McKinley County, the vanadium content is too low to warrant recovery. Processing plants at Bluewater and at Shiprock did not recover vanadium in 1956. Small quantities of San Juan County ore were shipped to Durango, Colo., and the recoverable content of these shipments was credited to New Mexico.

[2] Atomic Energy Commission, Statistics on Domestic Uranium Production and Reserves: Grand Junction (Colo.) Operations Office Press Release 178, Dec. 13, 1956, 3 pp.

Digitized by Google

**Zinc.**—Zinc output in New Mexico in 1956 was more than double that in 1955. The remarkable increase was due primarily to the continued increase in the price of zinc from an annual weighted average of 12.3 cents a pound in 1955 to 13.7 cents in 1956. This increase stimulated increased output at the mines reopened in 1955 and the reopening of other zinc mines in 1956. The leading zinc producers in the State in 1956, in order of output, were the Ground Hog, Hanover, Kearney, Bayard, and Lynchburg mines, which furnished 99 percent of total output.

## NONMETALS

**Barite.**—Barite production in New Mexico in 1956 came solely from the Mex-Tex Mining Co., Inc., which operated the Malchite mine 5 miles south of Bingham. The crude lead-barite ore was trucked 35 miles to the company mill at San Antonio, where lead and barite concentrates were produced. Output of ground barite was reported to be 4,059 tons in 1956, considerably less than production in 1955. The entire production of ground barite was used in preparing oil-well-drilling mud.

**Cement.**—The existence of a cement industry in New Mexico moved closer to reality in 1956 with the announcement by Permanente Cement Co. and Dewey Portland Cement Co. of plans to build plants.

Permanente Cement Co. revealed that it planned to construct a $10-million, 1.4-million-barrel plant at Scholle, 55 miles southeast of Albuquerque. Plant equipment would include a rotary kiln 12 feet in diameter and 450 feet in length, one of the largest in the industry.

Dewey Portland Cement Co. of Kansas City announced that it intended to build a $10-million plant at Placitas, 17 miles north of Albuquerque. Planned capacity was 1,250,000 barrels of cement annually; this will increase the number of company-owned plants to 3.

**Clays.**—The output of clays in New Mexico has declined since 1951. Clays sold and used in the State dropped to 39,600 tons in 1956, a decrease of 13 percent from 1955 and 59 percent from 1949.

**TABLE 15.—Production of clays, 1949–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1949 | 97,751 | $69,002 | 1953 | 49,089 | $103,931 |
| 1950 | 63,337 | 77,582 | 1954 | 47,832 | 83,085 |
| 1951 | 75,653 | 148,876 | 1955 | 45,351 | 108,582 |
| 1952 | 57,668 | 107,633 | 1956 | 39,623 | 95,386 |

The downward trend was due to decreased demand for building brick and other structural-clay products and partial substitution of other building materials in construction. New Mexico has few large, good-quality clay or shale deposits, thus a large volume high-grade building brick cannot be made at a favorable price. Of the 98,000 tons of clays produced in 1949, 60,000 tons was classified as adobe, whereas in 1956 only 16,000 tons of adobe clay was mined—an indication of higher incomes, better standards of living, and a change in consumer preference for better quality building materials.

Of the 39,600 tons of clays mined in 1956, only 8,300 tons was fire clay, whereas 31,300 tons was miscellaneous clay. The major producer

Digitized by Google

of fire clay was the El Paso Brick Co., followed by Phelps Dodge Corp., Gallup Brick & Tile Co., and Yacomo, Inc. The Kinney Brick Co., operating an open pit in Bernalillo County, produced the bulk of the miscellaneous clay. Other important producers were El Paso Brick Co. in Dona Ana County, Native Blanca Clay Co. in Chaves County, and Gallup Brick & Tile Co. in McKinley County. The State penitentiary also operated a miscellaneous-clay pit in Santa Fe County. The bulk of the output of miscellaneous clay was used for making brick and other heavy clay products, but 1,700 tons of carbonaceous shale was used as an admixture in preparing oil-well-drilling mud. Fire clay was used in manufacturing heavy clay products, firebrick and block, and furnace stoppers in copper smelters.

**Fluorspar.**—Shattuck Denn Mining Corp. announced that it had decided to sell its Acid-grade fluorspar mill at Los Lunas. The 400-ton-per-day plant had been operated by Zuni Milling Co., a Shattuck Denn affiliate, until competition from imported fluorspar forced its closing. The General Chemical mill at Deming, the only other Acid-grade mill in the State, also was idle in 1956.

**Gem Stones.**—The value of gem and ornamental stones produced in 1956 rose to $30,000 and included agate, serpentine, selenite, jasper, and desert scenic stone. The principal productive area was near Deming, Luna County, but output was also reported in Bernalillo, Catron, Hidalgo, Sierra, Socorro, and Valencia Counties.

**Lime.**—A rotary kiln and a continuous hydrator operated by the Chino Mines Division, Kennecott Copper Corp., yielded 35 tons of quicklime and 30,700 tons of hydrated lime. All output was used in copper concentration and water purification by the producing company.

**Mica.**—Production and sales of sheet mica in New Mexico in 1956 declined to 6,200 pounds compared with 9,400 pounds in 1955. This drop was due almost entirely to decreased activity at the Apache mine of J. H. Stivers, and shipments would have declined even more sharply had it not been for larger shipments of hand-cobbed mica by Continental Mine Products Co. from the Globe mine. Except for a small quantity of full-trimmed mica produced by Continental Mine Products Co. and Coronado Mining & Milling Co., all shipments made to the Government (GSA) Custer (S. Dak.) Purchase Depot were hand-cobbed material. Virtually all of the mine production came from Rio Arriba County in 1956, and the major producers were Continental Mine Products Co., Lothmann & Lothmann, J. H. Stivers, and Mica Corp. of America.

In conjunction with the production of hand-cobbed mica, 767 tons of scrap mica also was produced in 1956 compared with 84 tons in 1955. The increase was due almost entirely to activities of the Petaca Mining Corp. The company first shipped ground mica from its Petaca mill on February 20. The mill operated on an intermittent basis until July, when it was shut down to revamp part of the mill process to effect better recovery. In December the company announced plans for operating its Rio Arriba County mine and mill by the Minerals Engineering Co. of Grand Junction, Colo.

The Petaca mill was one of four processing firms in the country that used compressed air in fine grinding. In the compressed-air

Digitized by Google

**TABLE 16.—Mica sold or used by producers, 1954–56**

| | 1954 | 1955 | 1956 |
|---|---|---|---|
| Hand-cobbed mica: [1] Pounds | 39,036 | 219,894 | 174,367 |
| Sheet mica: [1] | | | |
| Full trimmed: | | | |
| Pounds | 8 | 399 | 11 |
| Value | $208 | $5,559 | $256 |
| Average per pound | $26.00 | $13.93 | $23.27 |
| From hand-cobbed mica: | | | |
| Pounds | 2,046 | 9,032 | 6,236 |
| Value | $13,637 | $59,371 | $52,310 |
| Average per pound | $6.67 | $6.57 | $8.39 |
| Total: | | | |
| Pounds | 2,054 | 9,431 | 6,247 |
| Value | $13,845 | $64,930 | $52,566 |
| Average per pound | $6.74 | $6.88 | $8.41 |
| Scrap mica: | | | |
| Short tons | ---- | 84 | 767 |
| Value | ---- | $2,475 | $22,213 |
| Average per pound | ---- | $29.46 | $28.96 |
| Total sheet and scrap mica: | | | |
| Short tons | 1 | 89 | 770 |
| Value | $13,845 | $67,405 | $74,779 |

[1] Sold to the Government through GSA.

process, crude mica is fed to a pulverizing and classification system at ½-inch and plus 18-mesh, which yields a product meeting closely controlled particle-size specifications. A fluid-energy system does the exacting job of air pulverization and classification. Dry mica is fed by a screw feeder into the pulverizing chamber. Here the mica is impacted while entrained in two opposed, high-velocity air streams. The mica is then carried to a classification section above the grinding chamber, which provides precise control of the end product by controlling the speed of rotation of the classifier blades and the amount of fan air introduced in this section. Thus, only particles of suitable size are discharged from the mill. Oversize particles are returned to the ends of the opposing high-pressure air nozzles, where they are entrained in the jets for further reduction. The jet pulverizer uses power provided by 2,500 c. f. m. of free air from a Worthington compressor, at 100 p. s. i., heated to 800° F. and distributed to the entrances of the opposing high-pressure nozzles.

A total of 717 tons of ground mica was produced by Petaca, of which 478 tons was used in paint and roofing and 239 tons in joint cement in the plasterboard industry. A grinding plant operated at Santa Fe also produced 50 tons of roofing mica.

**Perlite.**—Production of crude perlite in 1956 rose to 168,000 tons, a 13-percent increase over 1955 and a 98-percent gain over 1953. Great Lakes Carbon Corp., F. E. Schundler & Co., Inc., and United States Gypsum Co. were the only mine producers. Great Lakes Carbon Corp. also operated an expanding plant at Socorro. The 3 companies employed a total of 51 men—12 in mining operations, 24 at 2 mills, 1 at the expanding plant, and 14 at plant-auxiliary facilities.

**Potash.**—Five Carlsbad companies were active producers of potash in 1956, and many improvements were reported at their mines and refineries. A sixth company—National Potash Co.—entered the field in 1956, sinking two 15-foot-diameter shafts to 1,700 feet, laying a 21-mile waterline from Caprock, and constructing necessary aux-

Digitized by Google

iliary and office buildings and access roads. The Farm Chemical Resources Development Corp. moved closer to the status of a producing company by awarding a contract for design and construction of a shaft for the firm's potash mine 30 miles northeast of Carlsbad.

**TABLE 17.—Production of crude perlite, 1953–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1953 | 84,891 | $661,698 | 1955 | 147,805 | $1,091,250 |
| 1954 | 111,040 | 885,824 | 1956 | 167,705 | 1,270,993 |

**TABLE 18.—Production and sales of potassium salts, 1947–51 (average) and 1952–56, in short tons**

| Year | Crude salts; [1] mine production | | Marketable potash salts | | | | |
|---|---|---|---|---|---|---|---|
| | | | Production | | Sales | | |
| | Gross weight | $K_2O$ equivalent | Gross weight | $K_2O$ equivalent | Gross weight | $K_2O$ equivalent | Value |
| 1947–51 (average) | 5,406,980 | 920,347 | 1,848,733 | 1,013,753 | 1,851,831 | 1,014,287 | $35,851,343 |
| 1952 | 7,852,732 | 1,644,034 | 2,530,596 | 1,468,029 | 2,439,042 | 1,411,125 | 52,483,464 |
| 1953 | 9,100,671 | 1,908,280 | 2,937,960 | 1,721,435 | 2,661,587 | 1,552,831 | 58,676,435 |
| 1954 | 9,975,460 | 1,985,626 | 3,007,724 | 1,763,378 | 2,954,643 | 1,732,240 | 64,369,641 |
| 1955 | 10,956,466 | 2,159,010 | [2] 3,221,460 | [2] 1,898,770 | [2] 3,122,432 | [2] 1,841,122 | [2] 69,640,740 |
| 1956 | 11,941,474 | 2,304,572 | 3,383,882 | 1,996,693 | 3,278,977 | 1,930,754 | 72,802,302 |

[1] Sylvite and langbeinite.
[2] Revised figure.

Sales of potash in New Mexico—the Nation's leading potash-producing State—rose to 1.93 million tons valued at $72.8 million in 1956, compared with 1.84 million tons valued at $69.6 million in 1955. A byproduct hydrochloric-acid plant owned by International Minerals & Chemical Corp. operated in conjunction with the company potash refinery. A byproduct-magnesium-compound plant also was active in 1956, producing heavy magnesium oxide for the refractory, uranium-processing, and chemical industries.

The near completion of the sixth potash mine in New Mexico and the first in Lea County dominated the news of the industry in 1956. By the end of the year work on the National Potash Co. mine and mill was in the final stages. Begun in May 1955, the two shafts and accompanying refinery and auxiliary facilities are expected to be in operation by February 1957. The $18-million project will employ 300 men when the mine and refinery are in full production. This joint venture by Freeport-Sulphur Co. and Pittsburgh Consolidation Coal Co. will have an annual capacity of 400,000 tons of high-grade muriate of potash.

The Farm Chemical Resources Development Corp., owned jointly by the National Farmers Union, Kerr-McGee Oil Industries, Inc., and Phillips Petroleum Co., was the seventh operator to enter the potash field. Overall exploratory work was completed and an ore body established under some 15,000 acres. A concrete-lined shaft 15 feet in diameter and 1,700 feet in depth to service the mine was scheduled for completion in December 1957. Research to develop a refining

Digitized by Google

process had been under way for some time; but, before the company began constructing a refinery, a second shaft, and other facilities, it planned to test the refining process on the available ore. A daily output of 1,000 tons of finished product was expected when facilities were in full operation.

Other developments in 1956 included the merger of Pacific Coast Borax Co. and United States Potash Co. into the United States Borax & Chemical Corp. The United States Potash Co. Division completed a $3-million expansion program at the mine and refinery to increase production 20 percent. Work also progressed on a third shaft approximately 6 miles north of the original shaft. The company expected to begin mining the northernmost ore body early in 1957 with continuous miners and to transport the ore by conveyor belts. From the collar of No. 3 shaft the ore would be hauled to No. 1 shaft by 50-ton diesel trucks for processing at the refinery. The United States Potash Co. Division also reported constructing a new 100,000-ton storage warehouse at the refinery site, erecting a new chemical plant to produce high-purity potassium chloride, and building a new plant to produce a white, high-purity, granular muriate for agricultural use. The Potash Division of International Minerals & Chemical Corp. completed expansion of its potassium-sulfate plant, which now has a rated capacity of 400 tons a day. Capacity was increased by installing additional equipment in the refinery and chemical plants. The corporation also placed 125 new mine cars in underground service to keep pace with a stepped-up mining program.

Another innovation was introduced by the Potash Co. of America in 1956. Company engineers developed a method of measuring the weight of ore traveling on a conveyor belt. The device converts the weight of potash on the belt into air pressure, which activates a recorder pen attached to a circular chart.

**Pumice.**—Sales of pumice, pumicite, and scoria in New Mexico dropped to 292,000 tons in 1956, a 26-percent decrease from 1955. High freight rates, increased cost of production, and substitution of lower cost materials caused the decline. The largest consumers were concrete-aggregate and block producers and railroads. In 1956, 194,000 tons was used in concrete aggregate (251,000 tons in 1955) and 90,000 tons for railroad ballast (137,000 tons in 1955). Cleansing and scouring compounds, abrasives, concrete admixture, acoustic plaster, and insulating mediums consumed only 3 percent of the total output. Mine production was centered in Union, Dona Ana, and Rio Arriba Counties, although shipments were also reported from open pits in Sandoval and Santa Fe Counties.

Some high-grade pumice was processed in a mill at Santa Fe by James H. Rhodes Pumice, Inc., for use in cleansing and scouring compounds and hand soaps as an abrasive and in acoustic plaster, water filtering, paints, etc.

**Salt.**—Potash tailings continued to be the most important source of sodium chloride in New Mexico in 1956, although there was one producer of solar-evaporated salt. Total sales of rock and evaporated salt rose to 57,000 tons (an increase of 15 percent over 1955) owing to increased production in Eddy and Lea Counties. The bulk of the salt was used for cattle feed. Other uses were for oil-well drilling, water softening, ice manufacture, and meat packing.

Digitized by Google

Production in 1956 was again concentrated in Eddy County, where the principal producer of rock salt was the Salt Supply Co. The bulk of the rock-salt output in Lea County was reported by the Champion Salt Co., and solar-evaporated salt was recovered by the Curtis Salt Co. at Quemado, Catron County.

**TABLE 19.—Salt sold or used by producers, 1953–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1953 | 62,087 | $216,364 | 1955 | 49,738 | $596,780 |
| 1954 | 50,669 | 333,255 | 1956 | 57,156 | 501,049 |

**Sand and Gravel.**—Highway-construction activities continued to be the most important stimulus to increased production of sand and gravel. Output in 1956 rose to 6 million tons, a 32-percent increase over 1955 but 8 percent below the 6.5-million-ton peak of 1954.

Of the total State output, 4.5 million tons or 75 percent was produced by contractors engaged in highway construction. The remaining 25 percent or 1.5 million tons, classed as commercial sand and gravel, was produced for the local market. Six counties—Otero, Bernalillo, Dona Ana, Santa Fe, Torrance, Eddy, and Chaves—yielded 3.8 million tons (63 percent of the total). Of this quantity, 2.7 million tons (71 percent) was Government-and-contractor production.

**Stone.**—Stone output in New Mexico in 1956 dropped to 1.3 million tons, a 19-percent decline from 1955. The decrease was due entirely to a smaller output of stone by commercial producers. In 1955 commercial output was 700,000 tons, whereas in 1956 it was only 239,000 tons, due largely to a cutback in the production of crushed limestone and sandstone. In 1956 crushed sandstone comprised the bulk of the output, followed by crushed miscellaneous stone and limestone. A small quantity of dimension sandstone and crushed marble was sold for building purposes. Bernalillo, Valencia, Torrance, and Dona Ana Counties supplied most of the stone output of the State.

**Sulfur.**—Output of sulfur in New Mexico in 1956 declined 12 percent from 1955, largely because of reduced recovery at the Eunice plant of El Paso Natural Gas Co. Production decreases also were reported at the Monument works operated by the Warren Petroleum Corp.

**Vermiculite.**—As a result of the increased demand for exfoliated vermiculite marketed under the trade name Zonolite, Southwest Vermiculite Co. of Albuquerque doubled its output. All crude ore was received from out-of-State mines.

## MINERAL FUELS

**Carbon Dioxide.**—Production of natural carbon dioxide declined slightly in 1956 compared with 1955. The gas was produced from fields in Harding and Union Counties; other occurrences have been reported in Colfax, Mora, and Torrance Counties.

**Coal.**—Coal output from 24 underground and 3 strip mines in New Mexico was 158,000 tons in 1956 compared with 202,000 in 1955. Average employment dropped from 222 men to 175 men.

Digitized by Google

Kaiser Steel Corp., owner and operator of the Koehler mine, did exploratory drilling on its properties in Colfax County to discover and determine the extent of coking reserves.

**TABLE 20.—Production of coal, 1955–56, by counties. (Exclusive of mines producing less than 1,000 tons annually)**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Average value per ton [1] | Short tons | Average value per ton [1] |
| Colfax | 75,639 | $6.08 | 72,786 | $6.15 |
| McKinley | 88,123 | 6.63 | 50,868 | 5.50 |
| Rio Arriba | 14,860 | 5.48 | 16,025 | 5.16 |
| Sandoval | 3,797 | 4.28 | 2,537 | 5.11 |
| San Juan | 16,032 | 4.68 | 9,946 | 4.89 |
| Sante Fe | 3,128 | 6.25 | 4,582 | 9.25 |
| Socorro | | | 1,700 | 5.21 |
| Total | 201,579 | 6.13 | 158,444 | 5.82 |

[1] Value received or charged f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially).

**Helium.**—Helium shipments from the Bureau of Mines plant at Shiprock (San Juan County) continued to increase. In 1956 shipments totaled 76 million cubic feet compared with 54 million in 1955, 42 million in 1954, and 11 million in 1953, when operation of the plant was resumed to meet increasing demand by the Government and private industry. New Mexico's share of the national output rose from 23 percent in 1955 to 28 percent in 1956.

**Natural Gas.**—Marketed production of natural gas, primarily from oilfields of Lea County and the Blanco field of San Juan and Rio Arriba Counties, continued to gain. In 1956 the State output totaled 626 billion cubic feet compared with 541 billion in 1955 and 300 billion in 1951. The average wellhead price remained essentially the same as in 1955—8.9 cents per thousand cubic feet. The price in 1951 was 3.8 cents.

The Pacific Northwest pipeline was completed in 1956. Coincident with construction and completion of the new line, there was a steady increase in development of natural-gas-producing capacity. During the 3-year period 1954 through 1956, 1,430 successful gas development wells were completed in San Juan and Rio Arriba Counties; 619 of these wells were completed in 1956.

**Natural-Gas Liquids.**—The rise in marketed production of natural gas brought about a 14-percent increase in output of LP-gases and natural gasoline. Plants producing natural-gas liquids were listed in this chapter of Minerals Yearbook, 1955. Plans for an additional plant at Chaco (San Juan County) were announced by El Paso Natural Gas Co.

**Petroleum.**—Output of crude petroleum rose 6 percent in 1956 over 1955.

In Lea County, which yielded nine-tenths of the output of crude petroleum in New Mexico in 1956, exploration for oil shifted to the deeper Pennsylvanian and Devonian horizons. The average depth of wildcat wells in Lea County increased from 7,800 feet in 1955 to

Digitized by Google

**TABLE 21.—Wildcat- and development-well completions in 1956, by districts and counties**

[Oil and Gas Journal]

| District and county | Oil | Gas | Dry | Total | Footage |
|---|---|---|---|---|---|
| NORTHWEST NEW MEXICO | | | | | |
| Wildcat: | | | | | |
| McKinley | | | 24 | 24 | 52,700 |
| Rio Arriba | 1 | 7 | 4 | 12 | 71,000 |
| Sandoval | 1 | | 12 | 13 | 56,200 |
| San Juan | 12 | 1 | 43 | 56 | 258,000 |
| San Miguel | | | 1 | 1 | 3,200 |
| Total | 14 | 8 | 84 | 106 | 441,100 |
| Development: | | | | | |
| Rio Arriba | | 301 | 19 | 320 | 1,351,700 |
| Sandoval | 2 | 3 | | 5 | 19,200 |
| San Juan | 70 | 318 | 31 | 419 | 1,462,300 |
| Total | 72 | 622 | 50 | 744 | 2,833,200 |
| SOUTHEAST NEW MEXICO | | | | | |
| Wildcat: | | | | | |
| Chaves | 3 | | 24 | 27 | 74,500 |
| Curry | | | 2 | 2 | 11,200 |
| Eddy | 11 | 2 | 43 | 56 | 179,800 |
| Guadalupe | | | 2 | 2 | 8,200 |
| Lea | 27 | | 56 | 83 | 780,700 |
| Roosevelt | 1 | | 1 | 2 | 24,500 |
| Total | 42 | 2 | 128 | 172 | 1,078,900 |
| Development: | | | | | |
| Chaves | 82 | | 14 | 96 | 287,200 |
| Eddy | 158 | 1 | 32 | 191 | 451,700 |
| Lea | 493 | 41 | 61 | 595 | 3,366,700 |
| Total | 733 | 42 | 107 | 882 | 4,105,600 |
| Total all drilling | 861 | 674 | 369 | 1,904 | 8,458,800 |

9,400 in 1956. Offsetting the deeper drilling—frequently over 10,000 feet—were the abnormally high wildcat success ratio of 33 percent and satisfactory production rates from the newly discovered pools. At the close of 1956 the Oil and Gas Journal reported that over 50 wells were being drilled to depths of 10,000 feet or more in southeastern New Mexico.

The discovery of the Bisti field in 1955 and the Black Rock field early in 1956 stimulated oil-well drilling in San Juan County. Successful wildcat wells increased from 4 in 1955 to 12 in 1956 and successful development wells from none in 1955 to 70 in 1956. Most of the drilling was done along the northwest-southeast trend established by the Bisti and Black Rock discoveries.

Exploration in other northwestern counties resulted in oil discoveries in Rio Arriba and Sandoval Counties.

As a result of the newly discovered oil potential of the Four Corners area, construction was begun on one new refinery at Ciniza, east of Gallup in McKinley County, and expansion plans were announced for the refineries at Bloomfield (San Juan County) and Prewitt (McKinley County).

## REVIEW BY COUNTIES

**Bernalillo.**—The value of output of all minerals produced in Bernalillo County in 1956 rose to $1.25 million, a 26-percent increase over 1955. The quarrying and preparation of sand and gravel yielded

Digitized by Google

a product valued at $677,000; stone output was valued at $559,000 and clay output at $16,000. The county continued to be one of the major nonmetal-processing areas in the State. An exfoliated-vermiculite plant was operated by Southwest Vermiculite Co. and a brick plant by Kinney Brick Co., and numerous sand and gravel preparation plants and concrete-block plants were in operation.

**Catron.**—Sand and gravel production was again the main source of income of the mineral industry of Catron County. The total value of mineral output reached $173,000 in 1956 including $153,000 for sand and gravel. The entire output of sand and gravel resulted from highway contracts let by the State highway department; Longenbaugh & Coe and G. I. Martin were the contractor-producers.

**TABLE 22.—Value of mineral production in New Mexico, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Bernalillo | [2] $989,301 | $1,252,002 | Sand and gravel, stone, clays, gem stones. |
| Catron | [2] 83,379 | 173,030 | Sand and gravel, salt, gem stones. |
| Chaves | 181,898 | 336,922 | Sand and gravel, clays, stone. |
| Colfax | 466,521 | 494,300 | Coal, sand and gravel. |
| Curry | ---------- | 52,264 | Sand and gravel, stone. |
| De Baca | 27,250 | 77,000 | Sand and gravel. |
| Dona Ana | [2] 221,421 | 994,991 | Sand and gravel, stone, pumice, clays. |
| Eddy | [2] 70,262,128 | 73,997,331 | Potash, magnesium compounds, salt, sand and gravel, copper, stone. |
| Grant | [2] 53,773,331 | 73,414,329 | Copper, zinc, lead, molybdenum, lime, silver, manganese ore, stone, gold, sand and gravel, iron ore, clays, tungsten. |
| Guadalupe | 109,492 | 555,577 | Copper, sand and gravel. |
| Harding | ---------- | 35,259 | Sand and gravel, stone. |
| Hidalgo | [2] 1,797,760 | 1,903,535 | Copper, silver, gold, clays, manganese ore, lead, gem stones. |
| Lea | 549,771 | 438,827 | Sand and gravel, salt, sulfur. |
| Lincoln | 1,419 | (4) | Iron ore, rare-earth minerals. |
| Luna | [2] 271,986 | 253,887 | Manganese ore, sand and gravel, gem stones, lead, copper, silver. |
| McKinley | 607,902 | 345,939 | Coal, sand and gravel, clays. |
| Mora | 752 | 22,681 | Sand and gravel, copper, silver. |
| Otero | 236,088 | 590,438 | Sand and gravel, copper, lead, silver. |
| Quay | 15,824 | 99,500 | Sand and gravel. |
| Rio Arriba | 171,294 | 819,268 | Sand and gravel, copper, pumice, coal, mica, silver, columbium-tantalum. |
| Roosevelt | ---------- | 96,000 | Sand and gravel. |
| Sandoval | [2] 101,942 | 120,400 | Pumice, copper, manganese ore, sand and gravel, coal, stone, silver. |
| San Juan | 1,158,471 | 1,695,918 | Helium, sand and gravel, coal. |
| San Miguel | 20,249 | 134,530 | Sand and gravel, stone. |
| Santa Fe | 480,089 | 947,112 | Sand and gravel, pumice, coal, copper, zinc, lead, gold, silver, clays. |
| Sierra | [2] 6,855 | 40,497 | Lead, zinc, sand and gravel, silver, copper, gold, gem stones. |
| Socorro | [2] 816,884 | 2,945,459 | Manganese ore, gem stones, lead, zinc, sand and gravel, barite, silver, copper, stone, coal, gold, gem stones. |
| Taos | 667,639 | 631,954 | Perlite, sand and gravel, molybdenum, beryl, tungsten, copper. |
| Torrance | ---------- | 572,870 | Sand and gravel, stone, copper, silver. |
| Union | 384,484 | 386,061 | Sand and gravel, pumice, copper, silver. |
| Valencia | 500,522 | 625,837 | Perlite, stone, sand and gravel, copper, gem stones, gold, silver. |
| Undistributed | 302,589,307 | [5] 349,340,783 | |
| Total | [3] [6] 436,494,000 | [7] 513,303,000 | |

[1] Los Alamos County not listed because no production was reported.
[2] Excludes value of manganese ore sold and blended at Government low-grade stockpiles for future beneficiation.
[3] Revised figure.
[4] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[5] Includes petroleum, natural gas, natural-gas liquids, carbon dioxide (natural), sand and gravel, gem stones, vanadium, rare-earth minerals, uranium, and values indicated by footnote 4.
[6] Figure excludes uranium; value of uranium for 1955 was not released by the Atomic Energy Commission.
[7] Total has been adjusted to eliminate duplicating the value of raw materials used in lime manufacture.

Digitized by Google

The Curtis Salt Co. operated its Quemado solar-evaporation plant throughout 1956, and the salt was shipped to feed dealers for use by livestock and sold for use as water softener. A small quantity of agate was collected in the John Kerr Canyon area by McCargish Industries.

**Chaves.**—Nonmetals, petroleum, and natural gas were the only minerals produced in Chaves County in 1956. Total value of the output of nonmetals jumped from $182,000 in 1955 to $337,000, owing largely to increased output of sand and gravel. Sand and gravel production was divided nearly evenly between commercial production reported by J. D. Hurford, F. M. Reeves & Son, Inc., and F. A. Stacy & Son, and Government-and-contractor output. Armstrong & Armstrong, Floyd Haake, Harry Trotz, and Wheeler Construction Co. worked on highway contracts let by the State highway department.

Miscellaneous clay for use as a constituent in oil-well-drilling mud was produced by Native Blanco Clay Co. of Lovington. Three men were employed by the company. A small quantity of miscellaneous stone for riprap was produced by Armstrong & Armstrong and Floyd Haake in connection with highway contracts let by the State highway department.

**Colfax.**—Coal and sand and gravel were the only minerals produced in Colfax County in 1956. The value of coal production declined 3 percent—from $460,000 in 1955 to $447,000 in 1956.

Kaiser Steel Corp. (operator of the Koehler mine) carried out a drilling program on its coal properties to determine the extent and quality of coking-coal reserves.

Construction and maintenance crews of the State highway department produced 31,000 tons of paving gravel valued at $27,000, and Wylie Paving Co. (a contractor for the highway department) produced 12,000 tons of paving gravel with a value of $18,000.

**Curry.**—Armstrong & Armstrong and Harry Trotz produced 50,000 tons of paving gravel for highway projects under way in 1956, and Armstrong & Armstrong produced 264 tons of crushed miscellaneous stone for highway riprap.

**De Baca.**—Contracts let by the Federal Bureau of Reclamation (List & Clark, contractor) and the New Mexico State Highway Department (Floyd Haake, contractor) resulted in the production of 1,000 tons of structural sand, 6,000 tons of structural gravel, and 48,000 tons of paving gravel.

**Dona Ana.**—Nonmetals were the only minerals produced in the county in 1956, and the total value of output rose from $221,000 to $995,000 owing to a substantial increase in sand and gravel production. Sand and gravel sold and used in 1956 reached 609,000 tons valued at $715,500 compared with 48,000 tons valued at $44,000 in 1955. A. Courchesne Sand & Gravel Co. was the only commercial producer and reported an output of only 1,000 tons of paving gravel. On the other hand, the expanded highway-construction program of the State caused considerable activity by other sand and gravel producers. The city of Las Cruces, United States Corps of Engineers, and the State highway department were active through contracts let to private contractors and the output of construction and maintenance crews. McMillan Quarries, Inc., was the leading Government-and-contractor producer, followed by Brown Contracting Co. and Northwestern

Digitized by Google

Engineering Co.; each produced over 100,000 tons of sand and gravel.

Stone ranked second in value of output. Northwestern Engineering Co. reported production of 98,000 tons of crushed miscellaneous stone for concrete aggregate.

The entire output of scoria in the county was quarried at the Klinker claim near Aden of the Volcanic Cinder Co. Production in 1956 dropped to 58,000 tons—a 35-percent decrease from 1955. This cutback can be attributed to inability of the industry to compete successfully with lower price substitutes.

Mine production of clays remained relatively stable in 1956, and the entire output was reported by the El Paso Brick Co. The miscellaneous clay mined was used at the company brick plant at Brickland for manufacturing building brick and other structural-clay products.

**Eddy.**—The Permian basin of the Carlsbad region remained the focal point for the mining industry of the county in 1956. In terms of value, potash valued at $72.8 million was the most important mineral produced. Mines and refineries operated by International Minerals & Chemical Corp., Potash Co. of America, United States Potash Co. Division of the United States Borax & Chemical Corp., Duval Sulphur & Potash Co., and Southwest Potash Co. accounted for the output of potassium salts in New Mexico and for over 90 percent of the total United States output. Magnesium compounds and hydrochloric acid were recovered as byproducts by International Minerals & Chemical Corp. at its Carlsbad refinery.

Salt was the third-ranking mineral in value in 1956, and output increased slightly over 1955. The Salt Supply Co. and Carlsbad Salt Products, Inc., were the major producers.

Construction materials (sand and gravel and stone), a small quantity of copper, petroleum, and natural gas constituted the remainder of the total value of mineral production in the county. Except for 20,000 tons of commercial sand and gravel reported by Walter Nugent, all sand and gravel production in the county was quarried by contractors engaged in State highway work. Jack Adams, J. H. Ryan & Son, Inc., Henry Thygesen & Co., and construction crews of the State highway department produced 466,000 tons of paving gravel. J. H. Ryan & Son, Inc., quarried 439 tons of crushed miscellaneous stone for use as highway riprap.

The Lone Eagle Mining Co. shipped 349 tons of copper ore (containing 13,639 pounds of copper) from the Lone Eagle mine (15 miles northwest of Carlsbad in Eddy County) to the El Paso (Tex.) copper smelter of the American Smelting and Refining Co., in 1956.

**Grant.**—In order of importance, copper, zinc, lead, molybdenum, lime, silver, manganese, stone, gold, sand and gravel, iron ore, clays, and tungsten comprised the minerals produced in Grant County in 1956. The total value of output of all minerals rose to $73.4 million in 1956, compared with $53.8 million in 1955. The 36-percent gain was due almost entirely to an increased output of metals. Copper was the most important mineral produced and accounted for the bulk of the increase in value. Increased production also was reported for gold, silver, lead, zinc, lime, sand and gravel, and stone. On the other hand, decreased production was reported for clays, iron ore,

Digitized by Google

manganese, molybdenum, and tungsten. Metals composed 99 percent and nonmetals 1 percent of the total value of mineral output in 1956.

Gains in copper, lead, and zinc output were due to higher prices for these metals; output of gold and silver also increased because these precious metals were recovered principally as byproducts of copper, lead, and zinc.

Most of the county as well as the State output of copper in 1956, as in 1955, came from the Chino open-pit mine of the Kennecott Copper Corp., Chino Mines Division, at Santa Rita. According to the annual report of the Kennecott Copper Corp. for 1956, 69,629 tons of copper was recovered from 7,945,386 tons of ore and leach dumps in 1956, compared with 63,490 tons of copper from 6,992,950 tons of ore and leach dumps in 1955. The ore mined in 1956 averaged 17.4 pounds of copper a ton, whereas the ore mined in 1955 averaged 18.2 pounds. The ore was transported from the pit by railroad to the 22,500-ton-per-day concentrator at Hurley. The copper concentrate recovered from the ore was smelted in the smelter adjacent to the mill. Copper precipitate recovered by leaching the mine dumps was also smelted. Siliceous copper ore from the pit was used for flux in the smelter charge of concentrate and precipitate. Molybdenum was recovered in the Hurley mill as a byproduct of the copper ore. Part of the copper from the smelter was fire-refined at Hurley, and the remainder was marketed as blister copper for electrolytic refining. A selenium-bearing copper slag was separated during smelting and marketed for its selenium content.

No gold or silver was recovered from the fire-refined copper bullion at Hurley, but a substantial quantity was recovered from the residue sludge of blister copper that was refined by electrolysis.

The Ground Hog mine of the American Smelting and Refining Co. was the principal New Mexico producer of lead, zinc, and silver in 1956. The Hanover mine (operated by The New Jersey Zinc Co.) and the Kearney mine (operated by New Mexico Consolidated Mining Co.) were the second and third largest zinc producers in the State, respectively. Each of these mines operated all year in 1956 after reopening in 1955.

The Bayard mines owned by the United States Smelting, Refining and Mining Co. were operated by leasers throughout 1956. The ore was treated in the company 600-ton-per-day flotation mill where copper, lead, and zinc concentrates were recovered. As a group, the Bayard mines ranked second in output of lead, third in copper, and fourth in zinc and silver in the State in 1956.

In addition to these 5 major mines, 11 other mines produced gold, silver, copper, lead, and zinc in Grant County in 1956. Four of these mines were outstanding producers. Douglas B. White mined and treated 137,500 tons of copper ore from the Zuniga mine in 1956. This ore (130,000 tons treated by heap leaching and 7,500 tons by vat leaching) yielded 103 tons of copper precipitate containing 151,700 pounds of copper, which was shipped to the American Smelting and Refining Co. El Paso (Tex.) copper smelter. The Steeplerock Exploration Syndicate shipped 1,979 tons of ore (containing 186 fine ounces of gold, 11,345 ounces of silver, and 1,644 pounds of copper) to the El Paso copper smelter from the East Camp group of mines. The

Digitized by Google

Ace Mining Co. produced a substantial quantity of lead and zinc and smaller quantities of silver and copper from the Royal John mine. The ore was treated at the American Smelting and Refining Co. Deming mill and at the United States Smelting Refining and Mining Co. Bayard mill. The mine was closed on December 1 and the lease was dropped. Copper ore from the Austin-Amazon mine was shipped by Tejano Mining Co. to the El Paso smelter of the American Smelting and Refining Co. and to the Peru Mining Co. mill for treatment.

The Luck Mining & Construction Co. shipped 38,782 short tons (gross weight) of manganiferous ore (ferruginous manganese ore containing 10.5 percent manganese and valued at $138,508) from the Boston Hill mine in Grant County to the Colorado Fuel & Iron Corp. Pueblo (Colo.) plant for use in making steel in 1956.

All of the iron ore shipped in New Mexico in 1956 was mined by White & Mathis from Hanover-Bessemer's Pearson iron pit in Grant County and was used in manufacturing cement.

In the nonmetal group, lime produced and used in ore concentration by the Chino Mines Division, Kennecott Copper Corp., was the most important commodity. Wade A. White produced 39,000 tons of commercial sand and gravel, and construction crews of the New Mexico Highway Department produced 12,000 tons of paving gravel.

**Guadalupe.**—The Drusan Mining Co. shipped 23,637 tons of siliceous copper fluxing ore, containing 633 tons of copper, from the Stauber mine near Santa Rosa to the American Smelting and Refining Co. El Paso copper smelter. The mine was operated from March 1 to December 31, 1956. Copper ore, mined by Quentin M. Drunzer from the d'Autremont mine, also was shipped to the El Paso copper smelter.

**Hidalgo.**—The value of mineral production in Hidalgo County in 1956 increased to $1.9 million, a 6-percent gain over 1955, resulting mainly from an increased output of copper. An increase was also reported for lead, and a small quantity of manganese ore and concentrate was shipped to the Government purchase depot under the "carlot" program.

In 1956, as in each year since 1936, the Banner Mining Co. Miser's Chest group, 6 miles south of Lordsburg, was the leading metal producer in the county. Copper was the principal product, with gold and silver as byproducts. The company conducted an extensive exploration and development program in 1956 and installed a 200,000-gallon water-storage tank.

In all, 1,795 tons of gold-silver ore containing minor quantities of copper and lead was mined by Werner Lake Nickel Mines, Ltd., from the Henry Clay mine and shipped to the Phelps Dodge smelter at Douglas (Ariz.) and the American Smelting and Refining Co. smelter at El Paso. In addition, 1,368 tons of copper-lead ore was mined and treated at the Peru Mining Co. mill at Deming. Other mines in the county—Apache (Roy Billingsley), Anita (I. L. Moseley), and Bighorn & Buckhorn (Quad Mining Co.)—produced small quantities of silver and copper.

Combined Minerals, Inc., and John D. Flack shipped manganese ore from the Ridge No. 1 mine to the Government purchase depot under the "carlot" program administered by GSA.

465877—58——52

Digitized by Google

Phelps Dodge Corp. was the only clay producer in the county in 1956. Although the output decreased 7 percent, the total value of fire clay sold or used was 6 percent greater due to a higher average price. Agate and serpentine valued at $780 were collected near Red Rock.

**Lea.**—Oilfields of Lea County supplied over 90 percent of the crude petroleum and two-thirds of the natural gas produced in New Mexico in 1956. Petroleum exploration in the county in 1956 was notable because of the increased number of plus-10,000-foot wildcat holes and the high rate of success.

Sand and gravel produced by the Lea County Sand & Gravel, Inc., and construction crews of the New Mexico Highway Department was valued at $179,000. Salt was produced from potash tailings treated by Champion Chemical Co., K. L. Towle Trucking Co., and Lee S. Williams. The bulk of the output was used in oil-well drilling, but some refined salt was used as cattle feed. Lea County was the sole producer of elemental sulfur in the State; the entire output was recovered at two plants operated by El Paso Natural Gas Co. and Warren Petroleum Corp.

**Lincoln.**—The mineral industry of Lincoln County in 1956 comprised the mining and shipment of iron ore from the Ferro Iron Mines, Inc., pit by Magnetite Products Corp. and the processing and sale of combined rare-earth concentrate by the New Mexico Copper Corp. at Carrizozo. The iron ore was used in manufacturing underwater pipe lines and transmission lines, which had to weigh at least 4.25 times as much as water. The rare-earth concentrate was recovered from bastnaesite ore mined locally and treated at the company mill 2 miles west of Carrizozo.

**Luna.**—Reports from mineral producers indicated that manganese, sand and gravel, gem stones, lead, copper, and silver were the only minerals produced in Luna County in 1956. Without operation of the fluorspar mines of the region and with closing of the Deming fluorspar mill, the value of mineral output continued to decline and reached $254,000 in 1956—a 7-percent drop. The total value would have declined further, except for shipments of manganese ore and concentrate and gains reported in sales of sand and gravel and the base metals.

Sand and gravel production totaled 41,500 tons of which 31,500 tons was produced by Floyd Haake (a highway-department contractor) and construction crews of the State highway department. Luna County (particularly near Deming) was the center of gem- or ornamental-stone production in the State. Agate, the only material collected in 1956, was produced by Cholly Adams, Mrs. Clyde Brown, Ted Burkheiser, and the Deming Agate Shop.

Florida Manganese, Inc., shipped a substantial quantity of manganese ore under the Government "carlot" program from the Luna-Manganese Valley mine in 1956. The value of this ore composed the bulk of the total value of mineral production in Luna County.

Small quantities of silver, copper, and lead were recovered by direct-smelting small lots of ore from the Rimrock Nos. 1, 2, 3, and 4, Stenson group, Calumet, Lindy Ann, and Benefactor-group mines.

**McKinley.**—Uranium, coal, sand and gravel, and clays were the principal minerals mined in McKinley County in 1956.

Digitized by Google

Henry Thygesen & Co., a contractor for the State highway department, produced 32,000 tons of paving gravel valued at $56,000. Gallup Brick & Tile Co. continued to operate its open-pit clay mine, employing 4 men in mining for an average of 50 days. Of the 1956 shipments, half was used in manufacturing firebrick and block and half in oil-well-drilling mud.

Production of uranium ore continued to increase in McKinley County in 1956. Most of the ore came from mines in the Haystack Mountain-Poison Canyon area operated by Haystack Mountain Development Co., Holly Minerals Corp., Federal Uranium Corp., and others.

Major interest in the county, however, was centered on the Ambrosia Lake district where drilling indicated reserves of 25 million tons. Because of the depth (350–750 feet) and magnitude of the ore bodies, much of the drilling in 1956 was designed to confirm tonnage and grade of the deposits before major capital expenditures were committed on milling facilities and underground development.

Rio de Oro Uranium Mines, Inc., completed the Dysart shaft at the beginning of the year. The shaft, the first to be sunk to the ore horizon in the Ambrosia Lake district, was completed to a depth of 360 feet in the spring. In the following months, shaft facilities and a station were completed, horizontal development was carried out, and samples were taken for metallurgical tests.

At the end of 1956 work on five additional shafts had begun or was to begin during the winter; these shafts were: Kermac Nuclear Fuels, Inc. (sec. 10 and 22, T. 14 N., R. 10 W.); Holly Minerals Corp. (sec. 14, T. 14 N., R. 10 W.); Homestake-New Mexico Partners (sec. 32, T. 14 N., R. 9 W.); and Phillips Petroleum Co. (sec. 28, T. 14 N., R. 9 W.).

El Paso Natural Gas Products Co. began construction of a 7,000-barrel-per-day refinery at Ciniza east of Gallup. Design of the plant allowed for doubling the initial capacity. At Prewitt the company also announced plans to double the capacity of its 2,500-barrel-per-day refinery.

**Mora.**—Construction and maintenance crews of the New Mexico State Highway Department produced 39,000 tons of paving gravel in Mora County in 1956—the total value of mineral production, except for 1 ton of copper and 1 ounce of silver.

**Otero.**—In Otero County 13 mines or quarries produced minerals valued at $590,000 in 1956. Sand and gravel contributed the bulk of the value of the output, owing almost entirely to highway construction. T. J. Martin, McMillan Quarries, Inc., and Vowell Material Co. were contractors for the United States Corps of Engineers, and Henry Thygesen & Co. was contractor for the State highway department. Total Government-and-contractor production reached 301,000 tons valued at $229,000 in 1956. Frank P. Llewellyn, Inc., and Standard Aggregates Co., the only commercial operators, produced 349,000 tons valued at $358,000; 33 men worked an average of 229 days in commercial quarrying and preparation.

The metal output in Otero County was 3 tons of copper, 3 tons of lead, and 68 fine ounces of silver in 1956, recovered by direct-smelting ore from the Courtney, Speckilbird, Alamo Extension Nos. 2, 3, 4, and 12, and El Cobre Rico mines.

Digitized by Google

**Quay.**—Value of mineral production in Quay County was recorded as $99,500 in 1956 and resulted from Government-and-contractor sand and gravel produced by Longenbaugh & Coe and Leslie Wheeler, contractors for the State highway department, and commercial output by C. W. Roweth, contractor for the Chicago, Rock Island & Pacific Railroad, and Frank May.

**Rio Arriba.**—The mineral industry of Rio Arriba County recovered considerably from the precipitous drop in value of production in 1955. Value of output in 1956 reached $819,000, compared with $171,000 in 1955 and $603,000 in 1954.

Mica (hand-cobbed and scrap), pumice and pumicite, and sand and gravel were the nonmetals produced and accounted for 63 percent of the total value of mineral output. James P. Johnson, J. W. Jones Construction Co., Lowdermilk Bros., J. H. Ryan & Son, Inc., and D. D. Skousen & Son, contractors for the New Mexico State Highway Department, and construction crews of the highway department produced 298,500 tons of paving sand and gravel valued at $295,300 in 1956. These figures compare with 135 tons valued at $100 in 1955. New highway work accounted for the increase.

Production of pumice by the General Pumice Corp. dropped below that in 1955, as did output of scoria by Folsom Cinder Co. The bulk of 1956 shipments went to concrete-aggregate consumers, but part of the pumice was shipped to a mill at Santa Fe, which manufactured cleansing and scouring compounds, hand soap, and other abrasive-grade pumice.

Rio Arriba County was the major producer of sheet and scrap mica in 1956, and the value of mica sales rose to $75,000, compared with $64,000 in 1955. However, less hand-cobbed and more scrap mica was produced in 1956 than in 1955. Output from the Apache mine of J. H. Stivers dropped considerably below that reported for 1955. This drop was more than offset by larger shipments of hand-cobbed material from the Globe mine of Continental Mine Products Co. The latter company and Coronado Mining & Milling, Inc., shipped full-trimmed mica. Petaca Mining Corp. mined and ground most of the scrap-mica output.

A total of 7,231 fine ounces of silver and 251 tons of copper was produced in Rio Arriba County in 1956. The active mines were D. A. M. 1 through 8 (operated by the Mining Mountain Uranium Co.), London No. 4 (operated by Lee Williamson), and Eureka (operated by G. M. Baker and R. D. Morton).

**Roosevelt.**—The production of paving gravel by construction and maintenance crews of the New Mexico State Highway Department and Harry Trotz, a contractor on highway work, totaled 133,000 tons valued at $96,000. Output of washed or otherwise prepared gravel totaled 71,000 tons valued at $84,000.

**Sandoval.**—Despite a decline in the production of silver, copper, pumice and pumicite, stone, and coal in Sandoval County in 1956, total value of the output rose from $102,000 in 1955 to $120,400 in 1956. This gain was caused by increases in production of sand and gravel and shipments of manganese ore and concentrate.

Production and sales of volcanic scoria by the Big Chief Mining Co., Dooley Bros. Pumice, Inc., and Lava Pumice, Inc., totaled 38,000 tons value at $55,000—a decline of 21 percent in quantity and 12 per-

Digitized by Google

cent in value. Except for a small quantity used for concrete admixture and insulation, most of the scoria was used in concrete aggregate. The entire output of sand and gravel resulted from quarrying activities of the State highway department. C. R. Davis, contractor for the Federal Bureau of Reclamation, produced 526 tons of crushed basalt used for riprap.

The Bluebird mine, operated by Mid-Continent Exploration Co., and the San Miguel mine, operated by Great Eastern Mines, supplied the silver and copper output in the county in 1956.

**San Juan.**—The backbone of the mineral industry in San Juan County in 1956 continued to be the production and sale of natural gas and helium. The Navajo plant at Shiprock, operated by the Federal Bureau of Mines, was the only producer of helium in the State.

Government-and-contractor production of sand and gravel totaled 61,000 tons valued at $79,000, and commercial output reached 161,000 tons valued at $218,100. Commercial producers who reported sales were San Juan Gravel Products Co., Farmington Sand & Gravel Co., Jensen Ready-Mix Co., Inc., and Daniels Construction Co. Government-and-contractor production was reported by the State highway department and Skousen-Hise Contracting Co.

Oil-well drilling increased markedly in San Juan County in 1956. Late in 1955 El Paso Natural Gas Co. discovered the Bisti field in sec. 16, T. 25 N., R. 12 W. In the spring of 1956 British-American Oil Producing Co. discovered the Black Rock field 4 miles to the northwest in sec. 1, T. 25 N., R. 13 W. Development drilling between the two fields showed a continuous reservoir; successful wildcat drilling to the northwest and southeast established a trend of potential production more than 15 miles long.

At Bloomfield, El Paso Natural Gas Products Co. announced expansion of its small oil refinery from 500 to 1,500 barrels a day. The company also planned to construct a natural-gas processing plant at Chaco.

Uranium-vanadium ore was shipped to mills at Shiprock and Durango, Colo. Ores processed at Durango were the source of New Mexico's output of vanadium.

Kerr-McGee Oil Industries, Inc., completed the third modification of its uranium mill at Shiprock; a continuous solvent-extraction circuit was installed in October. The circuit, designed to handle half of the plant's pregnant solution from acid leaching, exceeded 99-percent recovery of the dissolved uranium. The Shiprock plant had a daily rated capacity of 500 tons in December.

**San Miguel.**—According to reports filed with the Bureau of Mines, sand and gravel and stone were the only minerals produced in 1956. The sand and gravel was produced by Henry Young Gravel Co. and contractors for the State highway department, and crushed and dimension sandstone was quarried by Taylor Quarries, Albert Coca, and Benito Lopez.

**Santa Fe.**—Increased output was reported for all minerals in Santa Fe County in 1956, except clays and pumice and pumicite. Sand and gravel led all minerals, with a production of 521,500 tons valued at $641,000; except for 72,000 tons of commercial material, the entire output was Government-and-contractor sand and gravel. Output of

Digitized by Google

scoria for concrete aggregate and pumice for cleansing and abrasive use continued to decline, owing to increasing production costs, distance from markets, and substitutes. As mine production of clay in New Mexico results from the need for clay by the State penitentiary, fluctuations in output are independent of economic factors affecting the clay industry in general.

The total value of the gold, silver, copper, lead, and zinc output in the county in 1956 more than doubled the value of the 1955 output. As in 1955, Western Mines, Inc., operated the Bottom Dollar mine and the Tom Payne mine and dump. The ore was concentrated at the American Smelting and Refining Co. mill at Deming. The Tom Payne mine and dump was the principal producer of lead and zinc in the county. The San Pedro Copper mine, operated by Tom B. Scartaccini, was the important producer of copper. Copper ore containing some silver was shipped from the Kindom-Moya No. 1 mine to the American Smelting and Refining Co. copper smelter at El Paso by the Kindom Uranium Corp. and by the Uranium Corp. of America. Small quantities of gold and silver were recovered by amalgamation of ore from the Elena Marie mine by The Onego Corp.

**Sierra.**—Combined value of the gold, silver, copper, lead, and zinc production in Sierra County rose to $32,400 in 1956 from $6,700 in 1955. Eleven mines, 2 with outputs of more than 100 tons of ore and 9 with outputs of less than 100 tons, accounted for the production. The two major mines were the Ivanhoe (McDaniel Investment Co.) and the Miner's Dream (Frank Daniel & Earl Richardson and Uni-Soil Oil & Uranium Corp.).

A small quantity of agate was collected near Engle, and construction crews of the highway department produced 7,000 tons of paving gravel.

**Socorro.**—In value of output, manganese ore and concentrate replaced perlite as the most important mineral commodity produced in Socorro County in 1956. Total value of production in the county reached $2.9 million, compared with $817,000 in 1955. Significant increases in production were reported for all minerals except barite, output of which declined 28 percent.

Nine mining operations in Socorro County in 1956 shipped 19,517 short tons (gross weight) of manganese ore and concentrate averaging 41.6 percent manganese and valued at $1.6 million. This ore was marketed under the Government "carlot" program administered by the GSA. Specifications limited the ore to a minimum of 40 percent manganese, and an annual maximum of 10,000 tons from each deposit. The Manganese Corp. of Arizona, operating the Red Hill and Big Basin mines, was by far the leading shipper of manganese ore and concentrate in the State and county. Other major producers were Joe Gianero from the Black Canyon mine, Pinnacle Mining Co. from the Black Crow mine, and the Rific Co. from the RFC pits.

The value of the output of gold, silver, copper, lead, and zinc in Socorro County increased from $220,000 in 1955 to $693,000 in 1956. Most of this increase was due to increased production of silver, lead, and zinc from the Lynchburg group, operated by C. S. Elayer under lease from The New Jersey Zinc Co. This mine ranked third in lead production and fifth in zinc and silver production in the State in 1956. The second-ranking lead producer in the county was the Malchite

Digitized by Google

mine, operated by the Mex-Tex Mining Co., Inc. The company mined and treated 26,839 tons of lead-barite ore, which yielded 536 tons of lead concentrate and 4,059 tons of barite. The lead concentrate contained 2,750 fine ounces of silver and 375 tons of lead.

Fourteen other mines produced gold, silver, copper, lead, and zinc in the county in 1956. Substantial quantities of silver and lead were produced by A. L. Greer & Associates from the Oscura mine. Of the remaining mines, the leading producers of silver, copper, lead, and zinc were the Nitt (operated by W. R. & W. L. Dobson), Queen group (operated by Mrs. Sadie Papa), and Waldo (operated by Chamberlin & Scartaccini).

Mining perlite continued to be the largest source of income to the nonmetallic-mineral industry. Production was reported by Great Lakes Carbon Corp. at its Socorro mine, where 5 men were employed an average of 260 days. The company also operated an expanding plant at the mine which employed 6 men for 215 days.

Construction materials (sand and gravel and stone), plus a small quantity of gem stones, accounted for the remaining value of output of nonmetals.

**Taos.**—The value of the output of the mineral industry of Taos County dropped to $632,000 in 1956, a 5-percent decline from 1955. This decrease was due almost entirely to lower mine production of molybdenite and a drop in the shipments of beryl and copper. No silver or mica production was reported, but a small quantity of sand and gravel and tungsten was mined and sold.

In Taos County, output of perlite increased, the only mineral to show a gain in 1956; a 7-percent rise in mine shipments was reported. F. E. Schundler & Co., Inc., operated its No Agua perlite property for 307 days, employing an average of 3 men in mining. In addition, 16 men were employed at the preparation plant for 173 days.

The Harding mine, operated by Arthur Montgomery, was again the leading beryl-producing mine in the county and State in 1956. The 60,000 pounds of beryl marketed to the Government through the GSA was hand-sorted from pegmatite. Andy Royball also produced beryl in the county and sold his output to Beryl Ores Co., Arvada, Colo.

Molybdenum Corp. of America continued to operate its molybdenum mine near Questa. The concentrate produced from the ore in the company mill at the mine was shipped to the refining plant at Washington, Pa., where molybdenum oxide, ferromolybdenum, and other molybdenum compounds were produced.

**Torrance.**—Mine production in Torrance County in 1956 was valued at $573,000 ($394,000 for sand and gravel, $177,000 for stone, $2,000 for copper, and $15 for silver), according to reports from mineral producers.

The entire output of sand and gravel came from Government-and-contractor operations. The State highway department produced 29,000 tons of paving gravel, and Skousen-Hise Contracting Co. and Wylie Paving Co., road contractors for the highway department, produced 487,000 tons of paving gravel. These contractors also produced 140,900 tons of crushed miscellaneous stone for use in concrete aggregate.

Digitized by Google

**Union.**—Pumice and pumicite, sand and gravel, silver, and copper were mined and sold in the county in 1956. Twin Mountain Rock Co. was again the only producer of scoria, and mine production dropped 20 percent owing to a decline in the demand for scoria as railroad ballast. Because of the accelerated highway-construction program, Government-and-contractor output of sand and gravel reached 233,000 tons, an increase of 43 percent over 1955. Crews of the highway department, Jack Adams, and Wylie Paving Co. were the only producers.

**Valencia.**—Uranium ores originating in Valencia County in 1956 were derived primarily from the Jackpile mine operated by The Anaconda Co., the largest producer in the State. In January the final acid-leach circuit of the Bluewater plant was placed in operation, bringing the total daily plant capacity to 3,000 tons. According to the annual report of the company, about one-fourth of the capacity was in the carbonate-leach section and three-fourths in the acid-leach section.

Ore from the Jackpile mine was transported by conveyor belt to a railroad siding, then carried by rail to Bluewater. In 1956 the company explored and developed a second ore body a few miles north of the Jackpile mine.

The Anaconda Co. reported its uranium reserves to be 15 million tons, with an average grade of 0.16 percent contained $U_3O_8$.

St. Anthony Uranium Co. was reported to have begun work on a 235-foot shaft north of the Jackpile mine.

Fifteen mining companies or individuals produced gold, silver, copper, perlite, sand and gravel, stone, and gem or ornamental stones valued at $626,000 in 1956, compared with 7 companies or individuals producing mineral products valued at $500,500 in 1955.

Perlite continued to be the principal nonmetallic mineral produced in the county, and the Grants quarry, operated by United States Gypsum Co., was the only producer. Four men were employed for 286 days at the mine and 16 men for 186 days at the mill. The Sais quarry of Sharp & Fellows Contracting Co. was again the principal producer of stone in the county, and 160,000 tons of crushed sandstone was quarried in 1956. Contracts let by the Federal Bureau of Reclamation and the New Mexico State Highway Department resulted in production of 2,000 tons of crushed basalt and 54,000 tons of crushed miscellaneous stone. Paving gravel produced by contractors for the State highway department totaled 62,000 tons valued at $55,000, and structural sand and gravel was produced by the Belen Sand & Gravel Co., which employed 4 men for an average of 80 days. Selenite, jasper, and agate valued at $624 were collected in the Laguna Reservation area.

Digitized by Google

# The Mineral Industry of New York

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, Department of the Interior, and the New York State Science Service.

By Joseph Krickich[1] and Geraldine C. Slaypoh[2]

NEW YORK mineral production in 1956 increased 9 percent in value compared with 1955 owing primarily to valuation increases of most of the State's 22 mineral commodities. Cement, iron ore, stone, sand and gravel, and salt, in decreasing order of value, were the leading minerals produced during the year. In terms of value, the centers of greatest mineral activity were St. Lawrence, Essex, Erie, Greene, and Columbia Counties.

**TABLE 1.—Mineral production in New York, 1955–56[1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Cement: | | | | |
| Portland.....376-pound barrels.. | 16,906,607 | $48,725,030 | (3) | (3) |
| Masonry.....do.... | 1,035,519 | 3,425,069 | (3) | (3) |
| Clays..... | 1,393,665 | 1,676,215 | 1,234,860 | $1,507,749 |
| Emery..... | 10,735 | 151,455 | 12,153 | 174,032 |
| Gem stones..... | (3) | 194 | (3) | 2,000 |
| Gypsum..... | 1,249,119 | 4,403,895 | 1,140,187 | 4,817,353 |
| Iron ore (usable).....long tons, gross weight.. | 3,201,927 | 38,018,783 | 3,188,276 | 41,093,670 |
| Lead (recoverable content of ores, etc.)..... | 1,037 | 309,026 | 1,608 | 504,912 |
| Lime..... | 82,890 | 1,365,481 | 86,737 | 1,029,996 |
| Natural gas.....million cubic feet.. | 3,637 | 1,073,000 | 4,098 | 1,160,000 |
| Peat..... | 5,622 | 51,740 | 2,900 | 23,244 |
| Petroleum (crude)...thousand 42-gallon barrels. | 2,904 | 10,310,000 | 2,748 | 12,091,000 |
| Salt (common)..... | 3,779,547 | 25,214,191 | 3,872,777 | 27,544,908 |
| Sand and gravel..... | 25,561,941 | 25,542,363 | 27,814,958 | 28,721,718 |
| Silver (recoverable content of ores, etc.) troy ounces.. | 66,162 | 59,880 | 84,158 | 76,167 |
| Slate..... | 90,668 | 1,344,715 | 64,282 | 913,544 |
| Stone..... | 22,812,222 | 37,919,063 | 22,805,494 | 36,134,765 |
| Zinc (recoverable content of ores, etc.)..... | 53,016 | 13,041,936 | 59,111 | 16,196,414 |
| Value of items that cannot be disclosed: Abrasive garnet, natural cement, crude iron oxide pigments, talc, titanium concentrate, wollastonite and items indicated by footnote 2..... | ..... | 8,721,015 | ..... | 6[illegible],969,168 |
| Total New York[4]..... | ..... | 216,907,000 | ..... | 237,016,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Weight not recorded.
[4] The total has been adjusted to avoid duplicating the value of clays and stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## NONMETALS

**Cement.**—In terms of value, cement was New York's most important mineral commodity in 1956. Portland, masonry, and natural cements were produced during the year. Production and value of all types of cements increased in 1956 compared with 1955. The average value per 376-pound barrel of portland, masonry, and natural cements increased from $2.88, $3.31, and $3.15 in 1955 to $3.06, $3.42 and $3.17, respectively, in 1956. Cement-producing counties for all types of cement, in decreasing order of value, were Greene, Erie, Columbia, Warren, Schoharie, Onondaga, and Ulster. Natural cement was produced in Ulster County.

**Clays.**—Production of miscellaneous clay decreased 11 percent in 1956 compared with 1955. The decrease was attributed to declines in the demand for clay used in manufacturing heavy clay products and cement, the principal uses for New York's miscellaneous clay. Other uses of clay in 1956 were as lightweight aggregate and for artificial abrasives, pottery, and stoneware. Twenty-one pits in 10 counties were active, with the bulk of production from Ulster, Albany, and Orange Counties.

**Emery.**—Although there was a steady demand, production and sales of emery ore increased only slightly in 1956 as compared with 1955. The entire output of emery in New York and the United States came from two open-pit operations in Westchester County. The output was used for abrasives.

**Garnet.**—Abrasive garnet was recovered from 2 operations in the State, 1 each in Essex and Warren Counties. The abrasive garnet produced in Essex County was recovered as a byproduct of wollastonite production and was sold for tumbling-barrel and rouge use. The garnet output of Warren County was used for sandpaper manufacturing and glass grinding and polishing.

**Gem Stones.**—The value of gem stones recovered in New York increased substantially in 1956 compared with 1955. The output of gem stones resulted from the efforts of several amateur gem collectors. Varieties of gem stones collected during the year included garnet, quartz, and tourmaline.

**Gypsum.**—Production of crude gypsum, all from underground operations, declined slightly in New York in 1956 compared with 1955. The gypsum-mining industry was centered in Erie, Genesee, and Monroe Counties. Gypsum-calcining plants were active in Bronx, Erie, Monroe, Rockland, and Richmond Counties. Bestwall Gypsum Co. acquired the gypsum mine and mill, as well as the perlite-expanding plant, of Certain-teed Products Corp. in Erie County during the year.

**Iron Oxide Pigments.**—Crude and finished iron oxide pigments were produced in New York in 1956. Crude iron oxide pigment (hematite) was mined in Oneida County and used to manufacture finished natural red iron oxide. Finished natural red iron oxide also was manufactured in St. Lawrence County from crude material shipped from outside the State.

**Lime.**—Quick lime and hydrated lime were produced in New York in 1956 by 3 operators, 1 each in Clinton, Erie, and St. Lawrence

Digitized by Google

**TABLE 2.—Production of crude gypsum, 1947–51 (average) and 1952–56**

| Year | Active mines | Short tons | Value | |
|---|---|---|---|---|
| | | | Total | Average per ton |
| 1947–51 (average) | 6 | 1,126,687 | $3,320,033 | $2.95 |
| 1952 | 5 | 1,143,920 | 3,816,148 | 3.34 |
| 1953 | 5 | 987,156 | 3,507,207 | 3.55 |
| 1954 | 5 | 1,133,579 | 4,005,353 | 3.53 |
| 1955 | 5 | 1,249,119 | 4,403,895 | 3.53 |
| 1956 | 5 | 1,140,187 | 4,817,353 | 4.23 |

Counties. The output was utilized for building, agricultural, chemical, and industrial purposes.

**Nitrogen Compounds.**—At two plants in Niagara Falls, Niagara County, atmospheric nitrogen was used in manufacturing fertilizers and explosives and in numerous other chemical and industrial applications.

**Perlite.**—Crude perlite from Western United States was expanded at six plants in Bronx, Erie, Genesee, and Onondaga Counties. The bulk of output was used as plaster aggregate. National Gypsum Co. reported that its new plant in New York City began expanding perlite from Colorado.

**Salt.**—Salt production was one of New York's major mineral industries. Output was derived from evaporated salt, rock salt, and brine. The average value per short ton of all types of salt sold or used by producers in New York increased from $6.67 in 1955 to $7.11 in 1956. Producing counties, in order of decreasing output, were Livingston, Onondaga, Tompkins, Schuyler, and Wyoming.

**TABLE 3.—Salt sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Evaporated | | Rock and brine | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 453,871 | $5,828,676 | 2,599,378 | $7,891,343 |
| 1952 | 508,317 | 6,674,698 | 2,909,126 | 10,071,764 |
| 1953 | 532,924 | 7,832,362 | 2,789,735 | 9,518,749 |
| 1954 | 529,602 | 8,734,524 | 2,883,034 | 14,019,594 |
| 1955 | 568,497 | 9,655,884 | 3,211,050 | 15,558,307 |
| 1956 | 560,693 | 10,116,141 | 3,312,084 | 17,428,767 |

**Sand and Gravel.**—In 1956 the output and value of sand and gravel increased 9 and 12 percent, respectively, compared with 1955. Production by both commercial producers and Government-and-contractor operators increased significantly to meet the increased demands for sand and gravel, primarily in highway and building construction. Eighty-two percent of the total sand and gravel output was washed, screened, or otherwise prepared. Production was reported from 54 of New York's 62 counties. The three leading sand and gravel producing counties were Suffolk, Nassau, and Erie, in decreasing order of output.

**Slate.**—Production and value of slate in New York decreased 29 and 30 percent, respectively, in 1956 compared with 1955. The

Digitized by Google

**TABLE 4.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| COMMERCIAL OPERATIONS | | | | |
| Sand: | | | | |
| Molding | 316,092 | $879,883 | (1) | (1) |
| Building | 7,525,795 | 7,443,321 | 8,370,927 | $8,417,239 |
| Paving | 6,058,430 | 5,204,455 | 4,897,649 | 4,636,483 |
| Blast | | | 3,470 | 1,215 |
| Engine | (1) | (1) | 28,636 | 32,017 |
| Filter | (1) | (1) | 40,823 | 59,403 |
| Other | 1,044,363 | 448,165 | 294,821 | 181,787 |
| Undistributed [2] | 45,548 | 68,129 | 371,501 | 1,019,755 |
| Gravel: | | | | |
| Building | 4,307,193 | 6,328,538 | 5,885,760 | 8,513,814 |
| Paving | 4,046,077 | 3,984,741 | 3,917,430 | 4,118,184 |
| Railroad ballast | 39,232 | 23,630 | 34,470 | 35,795 |
| Other | 593,247 | 454,425 | 1,600,058 | 1,098,767 |
| Total | 23,975,977 | 24,835,287 | 25,445,545 | 28,114,459 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS [3] | | | | |
| Sand: | | | | |
| Building | 2,086 | 2,639 | 20,877 | 28,706 |
| Paving | 450,630 | 224,897 | 166,452 | 89,723 |
| Gravel: | | | | |
| Building | 103,618 | 37,391 | 90,896 | 39,444 |
| Paving | 1,029,630 | 442,149 | 2,091,188 | 449,384 |
| Total | 1,585,964 | 707,076 | 2,369,413 | 607,259 |
| Grand total | 25,561,941 | 25,542,363 | 27,814,958 | 28,721,718 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes railroad ballast (1955), glass (1956), and data indicated by footnote 1.
[3] Includes figures for State, counties, municipalities, and other Government agencies.

decreased output was due to a decline in the demand for slate in the building industry. The number of active producers dropped from 13 in 1955 to 10 in 1956. The bulk of the State output was used for granules, flour, and flagging. Washington County was the center of the slate industry in New York.

**TABLE 5.—Slate sold by producers, 1947–51 (average) and 1952–56, by uses**

| Year | Operators | Roofing | | Flagging, granules, flour, and other uses | | Total value |
|---|---|---|---|---|---|---|
| | | Squares (100 square feet) | Value | Short tons | Value | |
| 1947–51 (average) | 17 | 1,224 | $36,193 | 132,873 | $1,719,819 | $1,756,012 |
| 1952 | 20 | 600 | 21,456 | 125,694 | 1,789,409 | 1,810,865 |
| 1953 | 20 | 566 | 20,037 | 113,345 | 1,713,295 | 1,733,332 |
| 1954 | 13 | 242 | 10,579 | 114,832 | 1,731,169 | 1,742,048 |
| 1955 | 13 | 82 | 5,587 | 90,635 | 1,338,128 | 1,344,715 |
| 1956 | 10 | 171 | 7,995 | 64,216 | 935,549 | 943,544 |

**Stone.**—The output of stone in New York in 1956 remained virtually the same as in 1955. Basalt, limestone, marble, sandstone, and miscellaneous stone were crushed or broken for highway and railroad construction and maintenance, concrete aggregate, riprap, and other uses. In addition, crushed and broken limestone was used in manufacturing cement and lime, for flux, and for agricultural purposes. Dimension limestone, sandstone, and miscellaneous stone also were

Digitized by Google

quarried for use as rough and dressed building stone, rubble, and curbing and flagging. Limestone continued to be the principal stone quarried in New York and constituted 88 percent of the total stone production. The leading stone-producing counties were, in order of decreasing value, Rockland, Dutchess, Onondaga, Erie, and Greene. A limited quantity of crushed or broken limestone for riprap, concrete aggregate, and roadstone was produced by Government-and-contractor operations and composed less than 1 percent of the State's total stone value.

**TABLE 6.—Stone sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Dimension stone: | | | | |
| Building stone | 22,603 | $662,274 | 20,192 | $677,470 |
| Curbing and flagging | 19,654 | 446,789 | 19,865 | 521,197 |
| Total | 42,257 | 1,109,063 | 40,057 | 1,198,667 |
| Crushed and broken: | | | | |
| Riprap | (1) | (1) | 256,737 | 433,642 |
| Crushed stone | 15,528,682 | 27,020,109 | 16,390,087 | 26,057,076 |
| Furnace flux | (1) | (1) | 124,339 | 239,990 |
| Agricultural | 430,169 | 1,048,467 | 419,986 | 1,342,430 |
| Other | 2,671,716 | 4,773,015 | 2,188,540 | 3,249,208 |
| Limestone for cement and lime | 4,139,398 | 3,968,409 | 3,376,748 | 3,613,752 |
| Total | 22,769,965 | 36,810,000 | 22,765,437 | 34,936,098 |
| Grand total | 22,812,222 | 37,919,063 | 22,805,494 | 36,134,765 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."

**Talc.**—New York was the leading talc-producing State in 1956. All production was from St. Lawrence County. The ground talc was sold for use in ceramics, paint, floor and wall tile, and miscellaneous other uses.

**Vermiculite.**—During the year, Zonolite Co. operated plants in Albany and Oneida Counties, exfoliating crude vermiculite from Montana, South Carolina, and South Africa.

**Wollastonite.**—Output of wollastonite increased in 1956 compared with 1955. This material was recovered from an open pit in Essex County, and the refined material was sold for use mainly in the paint and ceramic industries.

## METALS

**Iron Ore.**—Production of crude ore increased while shipments of usable ore decreased in 1956 compared with 1955. Although shipments of usable ore declined, valuation increased substantially owing to an increased average value per ton. The average value of New York's iron ore rose from $11.87 in 1955 to $12.89 in 1956. Five mines were active during the year—3 in Essex County and 1 each in Clinton and St. Lawrence Counties. All mines produced magnetite, the bulk of which was recovered from open-pit operations. Beneficiation of New York's magnetite consisted of magnetic separators, spirals and jigs, concentrating, and agglomerating. Most of the usable output was shipped as sinter. Pelletizing experiments were carried on at Republic

Digitized by Google

Steel's mines in the Port Henry district, and a pilot plant for pellet production will be in operation in the near future. The company sintered most of the concentrate from its mines at a 2-strand Dwight-Lloyd sinter plant, which had a capacity of 3,000 tons per day.[3]

**Lead.**—The production and value of New York's recoverable lead output increased 55 and 63 percent, respectively, compared with 1955. The increased production was due to an increased lead content of a predominantly zinc ore recovered from the Balmat mine in St. Lawrence County—the only lead-producing mine in the State. Increased valuation resulted from a national increase in the price of lead in 1956.

**Silver.**—Production of silver (a byproduct of lead and zinc mining at the Balmat mine in St. Lawrence County) increased substantially in 1956 compared with 1955. Increased demand for silver-free lead was the major contributing factor in the increased recovery of silver from the lead concentrates of the Balmat mine.

**Titanium Concentrate (Ilmenite).**—Ilmenite continued to be recovered as a coproduct of iron ore (magnetite) mining at the MacIntyre mine in Essex County. National Lead Co., operators of the MacIntyre mine, announced a 25-percent expansion in the capacity of the mine and mill at Tahawus, N. Y. The operation was the largest of its kind in the world. The announcement follows a statement by the company in October 1955 indicating the discovery of large new titanium deposits near its plant at Tahawus.[4]

**Zinc.**—A record high output of over 59,000 tons of recoverable zinc in New York was reported in 1956—an 11-percent increase compared with 1955. The previous record year was 1954, when production exceeded 53,000 tons of recoverable zinc. The increased production was due to higher grades of ore from the Balmat and Edwards mines in St. Lawrence County.

**TABLE 7.—Mine production of silver, lead, and zinc, 1947–51 (average) and 1952–56, in terms of recoverable metals**

| Year | Mines producing | Material sold or treated (short tons) | Silver | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|
| | | | Fine ounces | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 3 | 480,282 | 27,954 | $25,299 | 1,406 | $441,480 | 37,005 | $10,465,932 | $10,932,711 |
| 1952 | 2 | 437,099 | 38,895 | 35,202 | 1,120 | 360,640 | 32,636 | 10,835,152 | 11,230,994 |
| 1953 | 2 | 646,041 | 35,398 | 32,037 | 1,435 | 375,970 | 51,529 | 11,851,670 | 12,259,677 |
| 1954 | 2 | 662,665 | 34,576 | 31,293 | 1,187 | 325,238 | 53,199 | 11,490,984 | 11,847,515 |
| 1955 | 2 | 650,877 | 66,162 | 59,880 | 1,037 | 309,026 | 53,016 | 13,041,936 | 13,410,842 |
| 1956 | 2 | 657,445 | 84,158 | 76,167 | 1,608 | 504,912 | 59,111 | 16,196,414 | 16,777,493 |

## MINERAL FUELS

**Peat.**—Peat was produced in 1956 from three bogs in Duchess and Seneca Counties; it consisted of humus, moss, and reed or sedge peat.

**Petroleum and Natural Gas.**—Increased petroleum prices overcame a decrease in total output and caused a 17-percent increase in value compared with the previous year.[5] The increased output of natural

[3] Severn, Brown, Northeastern U. S.: Min. Eng., vol. 9, No. 2, Feb. 1957, p. 190.
[4] American Metal Market, National Lead Co. Expands Ilmenite in New York State: Vol. 63, No. 32, Feb. 17, 1956, p. 1.
[5] Kriedler, W. L., Developments in New York in 1956: Bull. Am. Assoc. Petrol. Geol., vol. 41, June 1957, No. 6, pp. 1006–1009.

Digitized by Google

gas did not bring about proportionate increase in value, however, owing to a drop in the average value at the wellhead. The average value of natural gas at the wellhead dropped from 29.5 cents per 1,000 cubic feet in 1955 to 28.3 cents in 1956. Of the 512 wells completed in 1956, 222 were oil, 14 gas, 213 service, and 63 dry. In all, 750,000 feet was drilled during the year. Gas reserves, as of January 1, 1957, totaled 77 billion cubic feet.[6]

## REVIEW BY COUNTIES

**Albany.**—The Callanan Road Improvement Co. at its Plant No. 1 produced crushed and broken limestone for riprap, blast-furnace flux, concrete aggregate, road material, railroad ballast, and agricultural purposes. The Grippy quarry operated by Julian Bocchi was idle in 1956. Albany Gravel Co., Inc., had six operations in 1956 at Bethlehem, Albany, Loudonville, and Cedar Hill, producing building and paving material. Charles M. Guptill recovered sand and gravel for paving purposes at an operation near Cohoes. Whitehead Bros. Co., with pits and fixed plants at Selkirk and Slingerlands, recovered molding sand. Harold S. Vincent & Son recovered gravel for road construction at their Selkirk operation.

The State of New York Department of Public Works produced paving sand. Miscellaneous clay production in Albany County was used for manufacturing brick and other heavy clay products, pottery, and artificial abrasives. Powell & Minnock Brick Works, Inc., Roah Hook Brick Co., and Sutton & Suderley Brick Co. (Coeymans), and Rex Clay Products Co., Inc. (Albany), were the active producers. Zonolite Co. (Albany) operated its vermiculite-exfoliating plant during the year and processed crude material from outside the State.

**Allegany.**—Building and paving sand and gravel was produced by Buffalo Slag Co., Inc., Alfred Station, and Thomas Moogan, Friendship. Alfred Atlas Gravel and Sand Corp. (Alfred Station) and Nick Codispoti (Belmont), produced sand and gravel for undetermined uses.

**Broome.**—In 1956 Broome County had 3 commercial and 2 Government-and-contractor operations. Barney and Dickensen, Inc. (Vestal) and Binghamton Crushed Stone & Gravel Co. (Binghamton) recovered structural and paving sand and gravel from their pits. Royal Winne produced structura and paving gravel at his Vestal pit. Crews of the Broome County Highway Department and the State of New York Department of Public Works produced paving gravel. Building sand and gravel was produced under contract for the City Engineer, Binghamton.

Corbisello Quarries, Inc., produced crushed and broken sandstone for riprap, concrete aggregate, and road material. Dimension sandstone for architectural and flagging purposes was quarried by W. R. Strong & Sons near Deposit. Earl Tompkins of Hancock processed dimension sandstone quarried in Broome County for use as rough construction, rubble, dressed stone, and flagging purposes. Miscellaneous clay for use in heavy clay products was produced at the Binghamton pit of Binghamton Brick Co., Inc.

---

[6] Oil and Gas Journal, Annual Review and Forecast Number, Jan. 28, 1957.

Digitized by Google

TABLE 8.—Value of mineral production in New York, 1955–56, by counties [1] [2]

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Albany | $1,538,008 | $1,416,215 | Stone, sand and gravel, clays. |
| Allegany | 261,003 | 265,350 | Sand and gravel. |
| Broome | 816,182 | 690,494 | Sand and gravel, stone, clays. |
| Cattaraugus | 463,163 | 777,223 | Sand and gravel, stone. |
| Cayuga | (3) | (3) | Stone, sand and gravel. |
| Chautauqua | 423,008 | 339,319 | Sand and gravel. |
| Chemung | (3) | (3) | Sand and gravel, clays. |
| Chenango | (3) | 122,064 | Sand and gravel. |
| Clinton | 4,852,994 | 5,311,890 | Iron ore, stone, lime, sand and gravel. |
| Columbia | 13,670,167 | (3) | Cement, stone, sand and gravel. |
| Cortland | 92,318 | (3) | Sand and gravel. |
| Delaware | 438,977 | 681,737 | Stone, sand and gravel. |
| Dutchess | (3) | (3) | Stone, sand and gravel, clays, peat. |
| Erie | 22,656,249 | 24,108,393 | Cement, sand and gravel, stone, gypsum, lime, clays. |
| Essex | 20,689,116 | 25,741,568 | Iron ore, titanium concentrate, wollastonite, sand and gravel, garnet. |
| Franklin | 111,647 | 111,066 | Stone, sand and gravel. |
| Fulton | 30,887 | 116,011 | Sand and gravel. |
| Genesee | 3,293,768 | 3,316,766 | Gypsum, stone, sand and gravel. |
| Greene | (3) | (3) | Cement, stone, sand and gravel. |
| Herkimer | (3) | (3) | Stone, sand and gravel, gem stones. |
| Jefferson | 768,959 | (3) | Stone, sand and gravel. |
| Kings | 50,620 | 18,320 | Sand and gravel. |
| Lewis | 29,773 | (3) | Stone, sand and gravel. |
| Livingston | (3) | (3) | Salt, sand and gravel. |
| Madison | 243,408 | (3) | Stone, sand and gravel. |
| Monroe | 2,750,812 | 2,924,089 | Stone, sand and gravel, gypsum. |
| Montgomery | (3) | (3) | Stone, sand, and gravel. |
| Nassau | 5,979,130 | 6,250,714 | Sand and gravel, clays. |
| New York | 354 | | |
| Niagara | 1,243,705 | (3) | Stone, sand and gravel. |
| Oneida | 1,673,118 | 1,798,040 | Stone, sand and gravel, crude iron oxide pigments. |
| Onondaga | 10,514,240 | 11,370,384 | Salt, stone, cement, sand and gravel, clays. |
| Ontario | 668,861 | (3) | Sand and gravel, stone. |
| Orange | 733,693 | (3) | Sand and gravel, clays, gem stones. |
| Orleans | (3) | (3) | Stone, sand and gravel. |
| Oswego | 285,399 | 226,066 | Sand and gravel. |
| Otsego | 62,670 | (3) | Do. |
| Putnam | 197,500 | (3) | Stone. |
| Rensselaer | 397,290 | 444,155 | Stone, sand and gravel, clays. |
| Rockland | (3) | (3) | Stone, sand and gravel, gem stones. |
| St. Lawrence | 34,493,983 | 38,234,301 | Iron ore, zinc, talc, stone, lead, sand and gravel, silver, lime. |
| Saratoga | 662,578 | 606,729 | Sand and gravel, stone. |
| Schenectady | (3) | 340,745 | Sand and gravel. |
| Schoharie | (3) | (3) | Cement, stone, sand and gravel. |
| Schuyler | (3) | (3) | Salt. |
| Seneca | (3) | (3) | Peat. |
| Steuben | 232,017 | (3) | Sand and gravel. |
| Suffolk | 6,178,841 | 6,613,096 | Do. |
| Sullivan | 255,900 | 291,626 | Sand and gravel, stone. |
| Tioga | 155,089 | (3) | Sand and gravel. |
| Tompkins | (3) | (3) | Salt, sand and gravel, stone. |
| Ulster | 2,745,252 | (3) | Cement, stone, clays, sand and gravel. |
| Warren | (3) | (3) | Cement, garnet, stone, gem stones, sand and gravel. |
| Washington | 1,476,304 | 1,074,990 | Slate, stone, sand and gravel. |
| Wayne | (3) | (3) | Stone, sand and gravel. |
| Westchester | 808,659 | 570,374 | Stone, emery, sand and gravel. |
| Wyoming | (3) | (3) | Salt, stone, sand and gravel. |
| Yates | 12,008 | 4,173 | Sand and gravel. |
| Undistributed | 74,949,459 | 103,249,909 | |
| Total | 216,907,000 | 237,016,000 | |

[1] The following counties are not listed because no production was reported: Bronx, Hamilton, Queens, and Richmond.
[2] Fuels, including natural gas and petroleum, not listed by counties, as data not available; value included with "Undistributed."
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

**Cattaraugus.**—Building and paving sand and gravel were recovered from the Allegany and Franklinville pits of Buffalo Slag Co., Inc. Other producers of sand and gravel in 1956 were Mrs. E. F. Lippert & Co. and William Lippert, both near Allegany; Ray Vogtli & Son,

Digitized by Google

Gowanda; Olean Gravel, Inc., Machias; Upper Allegheny Sand & Gravel Co., Inc., Onoville; and Work & Silvis, Red House. The State of New York Department of Public Works in Cattaraugus County produced paving gravel and limestone crushed for concrete aggregate and road material.

**Cayuga.**—Structural sand and gravel was produced by J. J. Harrington and Jay W. Robinson at their pits and fixed plants near Auburn. Paving and filter sand were also produced by J. J. Harrington. Crews of the Cayuga County highway department produced paving gravel. The Auburn quarry of General Crushed Stone Co. yielded crushed and broken limestone for use in highway construction ballast.

**Chautauqua.**—W. Lee Bull (Stow), Hildom Cinder Block Co. (Poland), Saybold Bros. (Dunkirk), and Sack's Pit (Jamestown) produced sand and gravel for structural purposes. Evans Builders Supply produced sand for construction purposes. Director of Public Works (Jamestown), Chautauqua County Highway Department (Falconer), and the State of New York Department of Public Works produced paving sand and gravel.

**Clinton.**—In 1956 Clinton County ranked second and third, respectively, in the value of lime and iron ore production. The Chateaugay underground and open-pit mine of Republic Steel Corp. continued to produce magnetite iron ore. Again this property ranked fourth among the iron ore mines of New York. International Lime & Stone Corp. (Chazy) quarried limestone for use as open-hearth and blast-furnace flux and road material and for agricultural purposes. It also continued to produce quicklime and hydrated lime for chemical uses at the Chazy plant. Lancaster Development Inc. (Dunkirk) produced crushed limestone for road construction.

Miscellaneous crushed stone for road construction, railroad ballast, and other uses was recovered as a byproduct of the Chateaugay mine of Republic Steel Corp. near Lyon Mountain. Paving sand and gravel was produced at Morrisonville by Bero Construction Co. Clinton County Highway Department and the State of New York Department of Public Works produced paving and structural sand and gravel.

**Columbia.**—In terms of value, Columbia County ranked third among New York's cement-producing counties. Lone Star Cement Corp. and Universal Atlas Cement Corp. operated their limestone quarries and cement plants near Greenport and Hudson, respectively. Catskill Mountain Stone Corp. crushed limestone for use in highway maintenance. The Columbia County Highway Department and State of New York Department of Public Works produced paving gravel. Paving sand, filter sand, and structural gravel were recovered by Columbia Sand & Gravel Corp. at its pit near Martindale Depot. F. H. Stickes & Sons produced structural and paving sand and gravel at its pit and fixed plant at Hudson. Reginald Sherman recovered paving sand from a pit near Lebanon Springs.

**Cortland.**—Sand and gravel for construction and paving purposes was produced and processed at a pit and fixed plant near Cortland by Cortland Ready Mix Concrete Co. Edward Morgan (Homer) produced paving and road gravel in 1956.

**Delaware.**—The leading sandstone producer, in terms of value, was American Bluestone Co. near Unadilla, which quarried rough and



Digitized by Google

dressed sandstone for building construction at its North River Quarry. Other dimension sandstone producers in Delaware County in 1956 included Johnson & Rhodes Bluestone Co., East Branch; Earl Tomkins, Hancock; and W. R. Strong & Sons, Deposit. The Delaware County Highway Department and the State of New York Department of Public Works produced paving gravel in 1956.

**Dutchess.**—Dutchess County had two limestone quarries active in 1956, the largest again being New York Trap Rock Corp. quarry at Clinton Point near New Hamburg. The output was used for riprap and highway and railroad maintenance. Dutchess Quarry & Supply Co., Inc., produced crushed limestone for concrete aggregate and road material at its Pleasant Valley quarry. The principal sand and gravel producer in the county was Fishkill Builders Supply Corp., with a pit and fixed plant near Beacon. Other producers were David Alexander, Stanford Sand & Gravel Plant, Larry Meddaugh, and Frank J. Melito, all of Poughkeepsie; Amenia Sand & Gravel, Inc., Amenia; Ralph Bierce, Pawling; Francis Ryan Sand & Gravel Co., Poughquag; Dutchess Quarry & Supply Co., Millbrook; and O. T. Cookingham, Red Hook. The Dutchess County Highway Department and Superintendent of Public Works produced paving gravel during 1956. Miscellaneous clay used for heavy clay products was recovered by Dennings Point Brick Works at its open-pit mine near Beacon.

**Erie.**—Erie County was displaced as second-ranking county among New York's mineral-producing counties, dropping to third in total value of mineral output in 1956. Cement continued to be the leading mineral produced in the county.

Lehigh Portland Cement Co. and Penn-Dixie Cement Corp. produced portland and masonry cements at plants near Buffalo. Louisville Cement Co. of New York produced masonry cement at its plant near Akron.

The leading sand and gravel producer was Pine Hill Concrete Mix Corp. (Lancaster). Other sand and gravel producers included Clarence Sand & Gravel Corp., and Meyer & Meyer, both of Clarence; Gravel Products Corp., Erie; Pfohl Bros., Inc., Lancaster; Arthur Maul, Orchard Park; Mrs. Leo Heary and Leroy Wiedman, both of Springville; North Collins Gravel, North Collins; Aurora Gravel, East Aurora; Dan Gernatt, Collins; and Jamison Bank Run Gravel Corp., Buffalo. The State of New York Department of Public Works in Erie County produced paving gravel during the year.

Buffalo Crushed Stone Corp. produced crushed limestone for riprap and highway and railroad maintenance at its Bowmansville quarry. The Cheektowaga quarry of the Federal Crushed Stone Corp. operated during 1956 and produced crushed and broken limestone for riprap, concrete aggregate, railroad ballast, asphalt filler and cement.

The leading clay producer in the county—Acme Shale Brick Co., Inc.—recovered miscellaneous clay to be used in heavy clay products at its Lake View Pit. John H. Black Co. (East Aurora) and Buffalo Brick Corp. (West Falls) mined clay for use in heavy clay products and as lightweight aggregate. Kelley Island New York Corp. produced quicklime and hydrated lime for building, agricultural, and chemical purposes, at its Buffalo plant.

Digitized by Google

On July 1, 1956, Bestwall Gypsum Co. took possession of the Certain-teed Products Corp. Erie County operations. This included the gypsum mine at Clarence Center and the gypsum-processing mill and perlite-expanding plant at Akron. Other gypsum producers were National Gypsum Co. (with a mine and plant at Clarence Center) and Universal-Atlas Cement Co. (Clarence). National Gypsum Co. (Clarence Center) and Buffalo Perlite Corp. (Buffalo) also manufactured expanded perlite from crude perlite from Western States.

**Essex.**—Essex County ranked second among New York counties in 1956 in total value of mineral output. Iron ore continued to be the most important mineral product of the county. The Fisher Hill and New Bed-Harmony-Old Bed iron ore mines of Republic Steel Corp. near Minesville operated throughout the year. National Lead Co. recovered iron ore and ilmenite concentrate from titaniferous magnetite ores at its MacIntyre mine and mill at Tahawus.

Sand and gravel for use in road construction and building was produced from pits owned by Saranac Lake Sand & Gravel Co., Inc., and Clarence G. Brooks (Saranac Lake) and Mrs. Ernest Smith (Elizabethtown). The Essex County Highway Department produced a small amount of gravel for paving purposes. Cabot Carbon Co. at Fox Knoll and Willsboro recovered wollastonite and byproduct (andradite) garnet. This garnet has been used very effectively for abrasive purposes, and Cabot Carbon Co. hopes to increase its annual production 3 to 5 times the present level.

**Franklin.**—Adirondack Stone Quarries, Inc., prepared dimension sandstone for rough construction and flagging purposes at its quarry near Burke. Louis Paro recovered sand and gravel for construction purposes at a pit near Malone. Paving sand was produced at Paul Smiths College, Paul Smiths. Other sand and gravel producers were Farmers National Bank, Bombay; Achille Blain and Dave Williams, Malone; Norman LaBounty, St. Regis Falls; and Saranac Inn and Walter Rock, Saranac Lake. The Franklin County Highway Department and State of New York Department of Public Works recovered sand and gravel for structural and paving purposes.

**Fulton.**—Paving sand and gravel was produced by E. G. Delia & Sons Construction Corp., Northville. Other sand and gravel producers during the year were Edward Bradt and Art Stone Co., Gloversville; John Edwards, Ephratah; and Herman Smith, St. Johnsville. The Fulton County Highway Department produced gravel for paving purposes.

**Genesee.**—Genesee County ranked second in value of gypsum production in New York in 1956. The United States Gypsum Co. mine and plant near Oakfield was the only producer of crude gypsum during the year. The largest limestone producer was Genesee Stone Products Corp., which quarried crushed and broken limestone for riprap, road material, railroad ballast, and agricultural purposes. The General Crushed Stone Co., and Leroy Lime & Crushed Stone Corp. (Leroy) crushed limestone for road material and railroad ballast.

Sand and gravel for structural and paving purposes was recovered by Batavia Washed Sand & Gravel Co., Inc., Batavia. Genesee County Highway Department and State of New York Department of Public Works produced sand and gravel for paving purposes.

Digitized by Google

**Greene.**—Greene County was the leading cement-producing county in 1956. Limestone was crushed for use in portland and masonry cement by Alpha Portland Cement Co., Cementon; Lehigh Portland Cement Co., Alsen; and North American Cement Corp., Catskill. Catskill Mountain Stone Corp. quarried sandstone, which was crushed for road material at its Cairo plant. Sand for sanding highways was produced by Lawrence Bros., Windham. Molding sand was recovered by Whitehead Brothers Co. at its Catskill and Coxsackie pits.

**Herkimer.**—Crushed limestone for road construction and agricultural purposes was produced by the General Crushed Stone Co., Jordanville. Crushed limestone for road material was quarried at the Newport quarry of Newport Quarries, Inc. Structural and paving sand and gravel was produced by F. J. Steber, Poland; Eastern Rock Products, Inc., Utica; and Material Sand & Gravel, Gravesville. The Herkimer County Highway Department produced gravel for paving purposes in 1956. John Moyer recovered a small amount of gem stones (quartz) in 1956 near Middleville.

**Jefferson.**—The General Crushed Stone Co. crushed limestone for highway and railroad maintenance at its Watertown quarry. Carbola Chemical Co., Natural Bridge, crushed limestone for use in whiting and insecticides. The highway departments of the towns of Cape Vincent, Hounsfield, and Lyne produced limestone for concrete aggregate and road material. Colwell Bros. (Watertown) was the leading sand and gravel producer in Jefferson County in 1956, producing sand and gravel for structural purposes and gravel used as fill. Other producers were Carlyle A. Loughlin, Anthony Marzano, Angelo Vespa, and City of Watertown, Watertown; Rural Sand & Gravel Co., Belleville; C. Fred Carter, Clayton; Ontario Construction Co., Chaumont; and Morris Hatcliffe, Donald Cool, and Frank Sischo, Adams. The Jefferson County Highway Department and the State of New York Department of Public Works produced sand and gravel for paving purposes.

**Kings.**—F. E. Grauwiller Transportation Co., Inc., produced building sand and other sands which were used for filter, engine, ballast, and fill purposes and for brick manufacture.

**Lewis.**—Messrs. Haggerty and Widrick (Lowville) produced paving gravel, and Hoch Bros. (also of Lowville) produced miscellaneous sands. Mr. Rudd of Lyons Falls recovered gravel for road construction. Mr. Nofstier produced paving sand. The Highway Department of Lewis County produced gravel for paving purposes. Limestone for use as riprap was produced by the town of Lowville.

**Livingston.**—Livingston County was the leading salt-producing county in New York in 1956. Rock salt was recovered from the Retsof underground mine of International Salt Co., Inc. The Valley Sand & Gravel Corp. produced paving and structural sand and gravel near Avon. Colburn and Davis (Conesus) produced sand for their private use. The Livingston County Highway Department and the State of New York Department of Public Works produced gravel for paving purposes.

**Madison.**—Conley quarry of Munnsville Limestone Corp. (Munnsville) and Worlock Stone Co., Inc. (Sullivan) quarried crushed and broken limestone for riprap, road material, agricultural uses, stone sand, and other purposes in Madison County in 1956. John Filose

Digitized by Google

produced a small quantity of miscellaneous stone for use in rock gardens from a quarry near Chittenango. Gossitt Concrete Products, Inc., produced gravel for railroad ballast.

**Monroe.**—Dolomite Products Co. produced crushed and broken limestone for riprap, concrete aggregate, highway and railroad construction, railroad ballast, and agricultural purposes. At its Penfield and Rochester plants Central Materials Corp. (near Sweden) produced crushed and broken limestone for riprap and highway construction and maintenance. The Ruberoid Co., the only producer of gypsum in Monroe County in 1956, operated its mine and mill at Wheatland.

The leading sand and gravel producer in Monroe County was Redman Sand & Gravel Corp. (Penfield), whose output was used for structural purposes. Sand and gravel for building and road construction was recovered by Brockport Ready Mix Concrete and Ingersoll Supply & Equipment Corp., Spencerport; Roy E. DeWitt, Webster; Elam Bros. Corp., Irondequoit; Newport Sand & Gravel Co., Penfield Gravel Co., and Rappl & Hoenig Co., Rochester area; and Dolomite Products Co., Inc., Manitou Construction Co., and Jack Miller. The State of New York Department of Public Works and the Highway Department of Monroe County produced gravel for paving purposes.

**Montgomery.**—Crushed and broken limestone for riprap, railroad ballast, and highway construction and maintenance was produced by Crushed Rock Products, Inc., and Cushing Stone Co., Inc., South Amsterdam. St. Johnsville Supply Co., Inc., produced sand and gravel for structural and paving purposes at its pit and plant in St. Johnsville.

**Nassau.**—Nassau County had eight commercial producers of sand and gravel in 1956. Building and paving sand and gravel were produced by Builders Sand & Gravel Corp., East Meadow; Colonial Sand & Stone Co., North Hempstead; Colonial Sand Stone Co., Inc., Port Washington; Metropolitan Sand & Gravel Corp., Port Washington; Penn Industries, Roslyn; Pine Hollow Sand & Gravel Co., and Approved Sand & Gravel Corp., Oyster Bay; and Milburn Contracting Co., Inc., Baldwin. The only producer of clay in Nassau County in 1956 was Nassau Brick Co., Inc., which manufactured heavy clay products from clay recovered at its pit at Farmingdale.

**Niagara.**—Gasport Sand & Gravel Co., Inc., recovered structural sand, paving sand, filter sand, and paving gravel at their pit and fixed plant at Lockport. The Niagara County Highway Department and State of New York Department of Public Works produced sand for paving purposes in 1956. Niagara Stone Corp., Niagara Falls, produced crushed limestone for highway construction. Royalton Stone Corp. (Gasport) and Frontier Stone Products, Inc. (Lockport), produced crushed and broken limestone for riprap, road material, agricultural and metallurgical work. Atmospheric nitrogen (anhydrous ammonia) was recovered at plants operated by E. I. du Pont de Nemours & Co., Inc., and Olin-Mathieson Chemical Corp. at Niagara Falls.

**Oneida.**—Eastern Rock Products, Inc. (Boonville) was the leading sand and gravel producer in Oneida County in 1956; along with the other sand and gravel companies in the county it produced structural

Digitized by Google

and paving sand and gravel, gravel for railroad ballast, and engine sand. The other sand and gravel producers in the county were George W. Bryant Core Sands, Inc., McConnellsville; Frank Cittadino, Clayville; John H. Waghorn and Mrs. Belva Driscoll, Barneveld; Hanicker Bros., and Rome Sand, Inc., Rome; Whitehead Bros. Co., McConnellsville; and Eastern Rock Products, Inc., Boonville. Sand and gravel for structural purposes was produced by the Oneida County Highway Department.

Limestone was quarried at the Oriskany Falls and Prospect quarries of Eastern Rock Products, Inc., in 1956 for riprap, railroad and highway construction, and agricultural purposes. Clinton Metallic Paint Co. produced crude red iron oxide and processed pigments for use in paint manufacture at its mine and mill at Clinton. Zonolite Co. exfoliated crude vermiculite from Montana, South Carolina, and South Africa at its Utica plant.

**Onondaga.**—The General Crushed Stone Co. (Fayettesville) was the leading sand and gravel producer in the county. During 1956 its output as well as the output of the other producers included sand and gravel for building and paving purposes. The other producers were S. F. Clough, Harlow H. Galster, Clarence Nichols, and W. F. Saunders & Son, Inc., all of Syracuse; Syracuse Sand & Gravel Co., Inc., Nedrow; William Hessler, William V. Young, and Cecile Perry, Clay; Steve Kravec, Jamesville; H. Amidon, Marcellus; Ruth Eno, Jordan; and E. Burgett. The superintendent of highways of the town of Elbridge produced gravel for paving purposes.

The Jamesville quarry of Allied Chemical & Dye Corp., Solvay Process Division, yielded crushed limestone for use in highway and railroad construction and agricultural purposes. Clay for use in manufacturing lightweight aggregate was produced by Onondaga Brick Corp. at its pit near Warners. Syracuse Pottery Co., Inc., Warners, mined red clay for use in pottery and stoneware. Syracuse Brick Corp. recovered miscellaneous clay at its Cicero pit for use in heavy clay products. Portland and masonry cements were produced at the Jamesville plant of Alpha Portland Cement Co. Expanded perlite was manufactured by Minerals Processing Corp., Syracuse, from crude material shipped from Western States. Allied Chemical & Dye Corp., Solvay Process Division, operated wells at Tully, and a plant at Solvay for producing evaporated salt.

**Ontario.**—The largest sand and gravel producer in the county was Ontario Sand & Gravel Co., Inc. The company operated a pit and fixed plant near Phelps, producing glass sand, molding sand, and gravel for paving and structural purposes. Other producers of sand and gravel, used mainly for road and building construction, included Nathan Oaks & Sons, Inc., Oaks Corners; McKenzie Sand & Gravel, Clifton Springs; and Hoadley Sand & Gravel Co., Inc., and Victor Malcuria Bros., Inc., both of Geneva. The Ontario County Highway Department and the State of New York Department of Public Works at Ontario produced gravel for paving purposes. Crushed limestone for railroad ballast and highway and railroad construction was quarried at the Geneva quarry of The General Crushed Stone Co. near Oaks Corners.

**Orange.**—The leading producer of sand and gravel in the county in 1956 was Otisville Sand & Gravel Co., Inc. Its pit and fixed plant

Digitized by Google

at Cuddebackville produced paving and building sand and gravel. A. W. Hollenbeck, Inc., Chester, produced filter sand, as well as structural and paving sand and gravel. Other sand and gravel producers in the county were Delaware Valley Sand & Gravel Co., Inc., Port Jervis; Newburgh Sand Stone & Gravel Corp. and C. Moriello, Newburgh; E. C. Townsend Estate, Cornwall; Windsor Building Supplies Co., Inc., Plum Point, Dickinson Sand & Gravel, Bloomingburg; F. Gibson, Monroe; and E. Stevens, Walden. The Orange County Highway Department recovered gravel for paving purposes in Orange County in 1956. Miscellaneous clay for heavy clay products was produced at the Newburgh plant of the Jova Brick Works. John Moyer recovered a small amount of gem stones (tourmaline) in 1956 near Tuxedo.

**Orleans.**—Clarendon Stone Co., Inc., quarried crushed limestone, which was used for concrete aggregate and road material at its quarry near Clarendon. Bank-run gravel for use as fill was recovered by Arnold H. Pickett Sand & Gravel Co. near Gaines. Donald Rorick (Medina) produced sand and gravel for structural purposes. Crawford Hucknell (Albion) had an output of paving and road gravel. The Orleans County Highway Department and the State of New York Department of Public Works in Orleans County produced sand and gravel for paving purposes.

**Oswego.**—Building and paving sand and gravel was produced by The General Crushed Stone Co. at its pit and fixed plant near Lacona. Molding sand was recovered near Pulaski by Whitehead Bros. Co. Building sand and gravel was produced at the Scriba pit of Davis Sand & Gravel Co. The highway department of Oswego County produced gravel for paving purposes.

**Otsego.**—Seward Gravel Co. (Colliersville), produced building and paving sand and gravel, as well as a small output of filter sand and gravel for railroad ballast. Unadilla Concrete Products Co. recovered building sand and gravel at its pit and fixed plant near Unadilla. The Otsego County Highway Department and the State of New York Department of Public Works in Otsego County produced gravel for paving purposes.

**Putnam.**—Eastern Mineral Co., Inc., produced crushed limestone at its quarry near Patterson for agricultural purposes and flooring compounds.

**Rensselaer.**—The Campbell Mountain quarry of Fitzgerald Bros. Construction Co. near Brunswick yielded Rensselaer grit (a conglomerate), which was sold for use as concrete aggregate and road material. Albany Gravel Co., Inc., the largest sand and gravel producer in Rensselaer County, operated pits near Rensselaer, Troy, and Wynantskill, producing structural and paving sand and gravel. Other sand and gravel producers were Ackner & Hunter, Averill Park; Everett Holser and Valente Sand and Gravel Co., Troy; Sidney B. Sharpe, Wynantskill; and C. W. Wicks, West Sand Lake. The city engineer of Rensselaer County produced gravel for paving purposes in 1956. Bleau Brick Works, Inc. (Troy), and Champlain Brick Co. (Mechanicville) produced clay for use in manufacturing heavy clay products and artificial abrasives.

**Rockland.**—In terms of value, Rockland County was the leading stone-producing county in New York in 1956. Crushed and broken

Digitized by Google

limestone used for riprap and highway construction and maintenance was produced at the Tomkins Cove Plant of New York Trap Rock Corp. The company was also the principal producer of basalt in Rockland County; output from its Haverstraw and West Nyack quarries was crushed and broken for riprap, concrete aggregate, roadstone, and other uses. Suffern Stone Co. (Suffern) quarried basalt for use in highway and railroad construction and maintenance. Sand and gravel producers in Rockland County in 1956 had an output of building and paving sands. Producers were Graney Building Material Corp., Sparkill; Mt. Ivy Sand & Gravel Co., Inc., Spring Valley; Ramapo Sand & Gravel Corp., Suffern; Ward Pavements, Inc., Thiells; and William H. Larenzen & Son, Pearl River. John Moyer recovered gem stones (pink garnet) near Hillburn.

**St. Lawrence.**—St. Lawrence County continued in 1956 to be the leading mineral-producing county in New York, with 16 percent of the State's total value. St. Joseph Lead Co. operated its Balmat and Edwards mines at capacity in 1956. The Balmat mine produced silver, lead, and zinc. The Edwards mine yielded zinc only. Jones & Laughlin Steel Corp. continued to operate its Benson mine near Starlake during 1956, and the concentrate produced was sintered for shipment to the company steel mills.

Crushed limestone, for highway maintenance and construction, and agriculture was produced by Balducci Crushed Stone Co., Gouverneur; Barrett Division, Allied Chemical & Dye Corp., Norwood; and McConville, Inc., Ogdensburg. Broken stone for riprap was produced by Barrett Division, Allied Chemical & Dye Corp.

The leading producer of building and paving sand and gravel in St. Lawrence County was Putnam Hawley Building Materials Co., Potsdam. Other producers of sand and gravel were: James Coffey, Pine Hill; Vance Lucas, Nicholville; K. J. Premo & Co., Massena; Miller Simms; and Emery Billings. The St. Lawrence County Highway Department and Department of Public Works produced sand and gravel for paving and structural purposes. Agricultural lime was produced by Balducci Crushed Stone Company at Gouverneur. Manufactured finished iron oxide pigments from crude iron oxide imported from outside the State was produced by Rossie Iron Ore Co.

New York talc production was centered in the Gouverneur and Edwards areas, St. Lawrence County. Three companies were active, recovering talc from underground mines and operating grinding mills.

**Saratoga.**—The major output of the 10 sand and gravel producers in Saratoga County in 1956 was molding sand. The leading producer in this area was Whitehead Bros., Saratoga. The other molding sand producers were: Albany Sand & Supply Co., Schuylerville and Ushers; John Belott & Son, Elnora; W. J. Dyer, Gansevoort; William Fawthrop, Mechanicville; Jewett Sand Co., Lashers; and Archie Meyers, Ushers. Hudson Valley Sand & Stone Co. (Wilton) produced paving sand and structural sand and gravel. The Highway Department of Saratoga County produced gravel for paving purposes. The Saratoga Springs Quarry of the Pallette Stone Corp. yielded crushed and broken stone for riprap, metallurgical purposes, highway construction, agricultural purposes, and miscellaneous filler.

**Schenectady.**—The major structural and paving sand and gravel producer in Schenectady County in 1956 was Scotia Stone & Gravel

Digitized by Google

Co. Other sand and gravel producers during the year included Melvin Borst, Rotterdam; DeLuke Sand & Gravel Co., Inc., Scotia; Ernest Quay, Scotia Stone & Gravel Co., and William M. Larnard & Sons, all of Schenectady; Whitehead Bros., Aqueduct; Bernard Beers, Wyatt's Crossing; and J. S. Garve, Glenville. The Highway Department of Schenectady County produced sand for paving purposes.

**Schoharie.**—Masick Soil Conservation Co., operated by A. Arthur Masick, used its production of crushed and broken limestone in manufacturing lime. North American Cement Corp. produced crushed limestone at its Howes Cave plant for use in portland and masonry cement production. Schoharie Stone Corp. (Schoharie) and Allied Materials Corp. (Cobleskill) produced crushed and broken limestone, which was used for riprap and road construction. The State of New York Department of Public Works in Schoharie County produced gravel for paving purposes in 1956.

**Schuyler.**—Watkins Glen plants of International Salt Co., Inc., and the Watkins Salt Co. recovered evaporated salt from artificial brines.

**Steuben.**—Steuben County had three active sand and gravel producers in 1956. The largest producer was Rhinehart & Son Sand & Gravel Co. (Corning) which had an output of structural and paving sand and gravel. The other producers were Bath Sand & Gravel Co. (Bath) and Buffalo Slag Co., Inc. (Cohocton). The Highway Department and State of New York Department of Public Works in Steuben County produced sand and gravel for structural and paving purposes.

**Suffolk.**—Suffolk County continued to rank first in sand and gravel production in 1956. The principal producer of sand and gravel in Suffolk County was Steers Sand & Gravel Corp., with a pit and fixed plant at Northport. Other active sand and gravel producers during the year were Metropolitan Sand & Gravel Co., with operations at Smithtown and Northport; U. S. Dredging Corp., Huntington; Broad Hollow Estates, East Coast Lumber Terminal, Inc., and J. W. Robinson & Sons, New Highway; Commack Sand & Gravel Co., Commack; Coram Sand & Gravel Corp., Coram; Roanoke Sand & Gravel, Middle Island; Setauket Sand & Gravel Co., East Setauket; and Penn Industries, Inc., Mount Sinai. The Suffolk County Highway Department produced sand and gravel for paving purposes.

**Sullivan.**—The leading producer of sand and gravel in Sullivan County was Sullivan Highway Products Corp. (Summitville); the other two producers were Louis Pshonick and Liberty Sand & Gravel Co., Inc. (Liberty). The Department of Public Works in Sullivan County produced gravel for paving purposes in 1956. Earl Tomkins with a stone yard in Hancock, processed dimension sandstone quarried in Sullivan County for use in rough construction, rubble, dressed stone, and flagging.

**Tioga.**—The leading producer of sand and gravel in Tioga County was Central Materials Corp. (Oswego), which recovered structural and paving sand and gravel. The other producers were Herman E. Bunce, Barton; Hollis Reed, Red Creek; and A. O. Swanson, Waverly.

**Tompkins.**—The leading producer of sand and gravel in Tompkins County was Rumsey-Ithaca Corp. (Ithaca); its output was used mainly for building purposes. University Sand & Gravel Corp. (Brooktondale) produced structural sand and gravel. Mrs. Amy H. Scott (Ulysses) produced paving gravel. The only dimension sandstone

Digitized by Google

producer in Tompkins County was Finger Lakes Stone Co., whose output was used for construction purposes. Paul Mancini & Sons abandoned its East Ithaca quarry.

The rock-salt mine and mill of Cayuga Rock Salt Co., Inc., near Myers operated during 1956. Evaporated salt was produced from artificial brines by the vacuum-pan process by International Salt Co., Inc., Ludlowville.

**Ulster.**—The Callanan Road Improvement Co. produced crushed and broken limestone for road construction and riprap. Curbstone was produced at the Jockey Hill quarry of Richard F. Dunn Estate, Elizabeth M. Dunn, executrix. The principal clay producer in Ulster County in 1956 was the Hutton Co., near Kingston, whose production was used for manufacturing heavy clay products. Other producers of miscellaneous clay in the county were Star Brick Corp., East Kingston; Brigham Brick Corp., East Kingston; and Alva S. Staples, Saugerties. James Ricker produced molding sand at his Connelly pit. Raymond Davis (Rosendale) produced building sand. Joe Clark (Kingston) and Tom Shuker (Gardiner) produced paving and road gravel.

**Warren.**—Jointa Lime Co., Inc., quarried limestone for highway construction and maintenance at its Glens Falls quarry. Glens Falls Portland Cement Co. operated its masonry and portland cement plant and limestone quarry at Glens Falls. Garnet for sandpaper manufacturing and glass grinding and polishing was produced from the open-pit mine and mill of Barton Mines Corp. at North Creek. H. Russell Harris (Glens Falls) produced paving and road gravel. Downing Braley recovered gem stone (garnet) in 1956 near North Creek.

**Washington.**—The only source of slate in New York in 1956 was Washington County. The principal producer was Central Commercial Co. (Hampton). Other producers included Darius Slate Products, Adolph A. Hadeka, Hilltop Slate Co., Theodore Pafundi, Joseph A. Ponda Slate Co., Western Slate Co., and Zayachek Bros., all of Granville; Henry Phillips, Hampton; and Vermont Structural Slate Co., Whitehall.

Hudson Valley Sand & Stone Co., at its Middle Falls quarry, produced crushed limestone for highway construction, agricultural purposes, and chemical uses and dimension stone for use as rubble in wall facings and fireplaces. The leading sand and gravel producer in Washington County in 1956 was Ray Stout, Argyle. Other producers included Hattie Dawson and Julius H. Hunt, Fort Ann; Ernest LeClair, Clemons; George Lightbody, Argyle; James Wever, Salem; and William Perry, Eagle Bridge. The Argyle superintendent of highways in Washington County produced sand and gravel for paving purposes.

**Wayne.**—Wayne County had 3 active commercial and 6 Government-and-contractor sand and gravel operations in 1956. M. A. Montmorano & Sons (Clyde) was the leading producer in the county and had an output of gravel that was used for road gravel and paving purposes. The other two commercial producers were Llewellyn Welch (Savannah) and Gustavus W. Young (Clyde). Government-and-contractor producers of sand and gravel for paving purposes in 1956 were Macedon superintendent of highways, Palmyra superintendent of highways, Rose superintendent of highways, Savannah superintendent of highways, Sodus superintendent of highways, and

Digitized by Google

Walworth superintendent of highways. The General Crushed Stone Co. (Sodus) quarried limestone, which was crushed for use in highway and railroad construction and agricultural purposes.

**Westchester.**—New York Trap Rock Corp. operated the Verplanck quarry, which produced crushed and broken limestone for use in highway construction and asphalt filler. The Thornwood quarry of Universal Marble Products Corp. produced white marble, which was crushed for various uses. Some of these uses included: Asphalt filler, hand soap, sweeping compounds, adhesives, chemicals, stucco, roofing, and bird gravel. Three commercial sand and gravel producers were active in Westchester County in 1956 and produced building and paving sand and gravel. The producers were: Bedford Hill Concrete Products Corp., Bedford Hills; Camarco Materials & Supply Co., Somers; and Peekskill Masons Supply Co., Peekskill. Joe DeLuca (Peekskill) and DiRubbo & Ellis (Croton) produced emery from the DeLuca mine and the Kingston mine, respectively.

**Wyoming.**—The Ambluco quarry of American Bluestone Co. (Portageville) produced architectural stone, both sawed and dressed. The Newburgh city engineer produced gravel for paving purposes. Evaporated salt from artificial brines was produced by the open-pan and vacuum-pan processes at the Silver Springs plant of Morton Salt Co.

**Yates.**—The Jerusalem town superintendent produced gravel for structural purposes in 1956.

Digitized by Google

Digitized by Google

# The Mineral Industry of North Carolina

This chapter has been prepared under a cooperative agreement for collecting mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of North Carolina.

By James L. Vallely,[1] Jasper L. Stuckey,[2] and Mildred E. Rivers[3]

NORTH CAROLINA mineral production in 1956 was valued at $40 million—down 3 percent from the $41.2 million reported for 1955. Although substantial gains in value were made by clays, feldspar, and sand and gravel, they were offset by decreases in the value of sheet and scrap mica, crushed limestone, and tungsten concentrates. The value of abrasive stones, gem stones, basalt, granite, marble, olivine, and the metals gold, silver, copper, and lead was also higher than in 1955. Sandstone (quartz) and talc decreased from the preceding year, and there was no production of absestos, miscellaneous stone, or vermiculite in 1956. The value of sand and

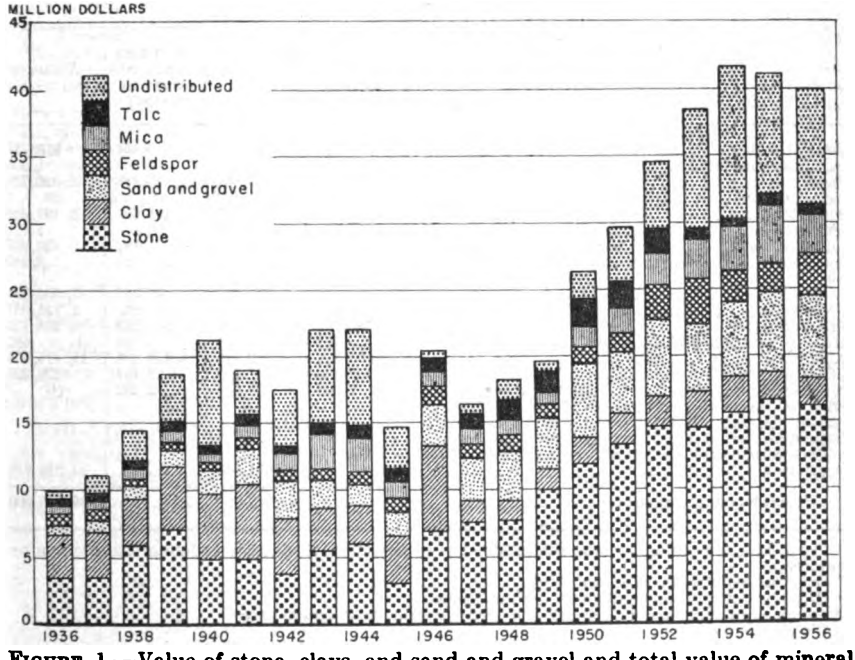



FIGURE 1.—Value of stone, clays, and sand and gravel and total value of mineral production in North Carolina, 1936–56.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Knoxville, Tenn.
[2] State geologist, North Carolina Geological Survey, Raleigh, N. C.
[3] Supervising statistical assistant, Region V, Bureau of Mines, Knoxville, Tenn.



Digitized by Google

gravel and stone was over 50 percent of North Carolina's mineral-production total. Among the States, North Carolina ranked first in the production of feldspar, sheet and scrap mica and olivine, third in combined production of talc and pyrophyllite and tungsten, and fifth in the production of kaolin; it was the only State reporting the production of millstones.

New developments in the mineral industry of the State included: Sinking of a new shaft at the Ore Knob mine of Appalachian Sulfides, Inc. in Ashe County, construction of a new feldspar-flotation plant in Mitchell County, and opening of a new kyanite mine in Gaston County. Two lease agreements were approved by the North Carolina Council of State for prospecting parts of Albemarle Sound, Pamlico Sound, Pamlico River, and Chowan River for ilmenite.

Under the Defense Minerals Exploration Administration (DMEA) program of Government participation in exploration for critical and strategic minerals, 71 contracts were in force during 1956. In all, $164,575 was spent on these projects during the year, of which the Government share was 75 percent. In 1955 the total spent on 73 projects was $177,298. Two projects—one each in Cabarrus and Vance Counties—were for tungsten and the others for mica.

**TABLE 1.—Mineral production in North Carolina, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Abrasive stones | [2] 227 | [2] $12,104 | [2] 454 | [2] $15,741 |
| Beryllium concentrate—pounds | (4) | (4) | 6,302 | 1,905 |
| Clays | 2,375,494 | 1,792,081 | 2,663,448 | 2,026,709 |
| Copper (recoverable content of ores, etc.)—pounds | 300 | 112 | (4) | (4) |
| Feldspar—long tons | 242,724 | 2,184,793 | 255,637 | 3,191,559 |
| Gem stones | (5) | 10 | (5) | 1,000 |
| Gold (recoverable content of ores, etc.)—troy ounces | 190 | 6,650 | 882 | 30,870 |
| Lead (recoverable content of ores, etc.) | 2 | 596 | 10 | 3,140 |
| Mica: | | | | |
| Scrap | 60,887 | 1,377,035 | 47,125 | 1,064,631 |
| Sheet—pounds | 553,444 | 2,745,234 | 770,903 | 2,135,057 |
| Sand and gravel | 7,785,741 | 5,911,223 | 7,580,593 | 6,264,135 |
| Silver (recoverable content of ores, etc.)—troy ounces | 181 | 164 | 753 | 682 |
| Stone | 10,903,366 | 16,532,910 | [6] 8,352,274 | [6] 11,471,609 |
| Talc and pyrophyllite | 125,206 | 571,689 | 125,487 | 529,205 |
| Tungsten concentrates—60-percent $WO_3$ basis | 2,609 | (4) | 2,732 | (4) |
| Value of items that cannot be disclosed: Asbestos (1955), olivine, stone (crushed limestone, marble, sandstone, basalt and dimension granite and marble, 1956), vermiculite (1955), and values indicated by footnote 4 | | 10,074,950 | | 13,248,948 |
| Total North Carolina | | 41,210,000 | | 39,985,000 |

[1] Production as measured by mine shipments, sales or marketable production (including consumption by producers).
[2] Grinding pebbles and tube-mill liners.
[3] Grinding pebbles, tube-mill liners, and millstones.
[4] Figure withheld to avoid disclosing individual company confidential data.
[5] Weight not recorded.
[6] Excludes certain stone; value included with "Items that cannot be disclosed."

Digitized by Google

TABLE 2.—Average unit value of mineral commodities produced in North Carolina, 1948–51 (average) and 1952–56 [1]

| Commodity | 1948–51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Abrasives: | | | | | | |
| Grinding pebbles.....short ton.. | $17.10 | $18.00 | $17.60 | $20.25 | $21.91 | $24.60 |
| Tube-mill liners.....do.... | 16.30 | 21.75 | 17.95 | 22.00 | 22.71 | 25.18 |
| Asbestos.....do.... | (2) | ---- | 21.10 | 17.10 | 8.95 | ---- |
| Beryl.....do.... | 275.00 | ---- | 400.00 | 504.76 | 591.60 | 601.67 |
| Clay: | | | | | | |
| Kaolin.....do.... | 20.04 | 20.80 | 18.87 | 18.80 | 16.69 | 22.07 |
| Miscellaneous.....do.... | .93 | 1.16 | 1.16 | 1.15 | [3].61 | .58 |
| Coal.....do.... | 7.65 | 7.93 | ---- | ---- | ---- | ---- |
| Columbite-tantalite (70-percent concentrate).....pound.. | (2) | 3.20 | ---- | ---- | ---- | ---- |
| Feldspar.....long ton.. | 6.26 | 10.05 | 12.28 | 9.62 | 9.00 | 12.48 |
| Manganiferous ore (10–35 percent Mn) long ton.. | (2) | ---- | 20.00 | ---- | ---- | ---- |
| Mica: | | | | | | |
| Scrap.....short ton.. | 25.55 | 26.48 | 25.14 | 23.87 | 22.62 | 22.59 |
| Sheet.....pound.. | .25 | 1.12 | 2.11 | 3.73 | 4.96 | 2.77 |
| Olivine.....short ton.. | 17.89 | 28.36 | 18.78 | 20.48 | 16.00 | 15.08 |
| Quartz.....do.... | 3.96 | 4.61 | 5.70 | 4.27 | (4) | (4) |
| Sand and gravel: | | | | | | |
| Gravel.....do.... | 1.10 | 1.11 | 1.16 | 1.10 | 1.15 | 1.17 |
| Sand.....do.... | .40 | .38 | .47 | .47 | .49 | .58 |
| Stone: | | | | | | |
| Granite: | | | | | | |
| Crushed.....do.... | 1.42 | 1.44 | 1.42 | 1.41 | 1.40 | 1.37 |
| Dimension.....do.... | 48.91 | 54.45 | 33.90 | 41.13 | 33.81 | ---- |
| Limestone: Crushed.....do.... | 1.35 | 1.35 | 1.39 | 1.39 | 1.37 | 1.32 |
| Marble: | | | | | | |
| Crushed.....do.... | 2.70 | 5.34 | 5.60 | 6.75 | 7.88 | 12.24 |
| Dimension.....do.... | 116.38 | 117.50 | 117.70 | 117.62 | 117.62 | 117.62 |
| Miscellaneous, crushed.....do.... | 1.12 | 1.08 | 1.21 | 1.25 | 1.10 | ---- |
| Sandstone: | | | | | | |
| Crushed.....do.... | 1.36 | ---- | ---- | ---- | [3]4.59 | 4.30 |
| Dimension.....do.... | ---- | 2.40 | ---- | ---- | 6.86 | 10.98 |
| Traprock: Crushed.....do.... | 1.66 | 1.29 | ---- | 1.46 | 1.43 | 1.24 |
| Talc and pyrophyllite.....do.... | (2) | [3]15.34 | 4.85 | 3.44 | 4.57 | 4.22 |
| Vermiculite.....do.... | 13.09 | 8.93 | 8.93 | 8.92 | 8.46 | ---- |

[1] For greater detail on prices by grade and market, see vol. I, Minerals Yearbook, 1956.
[2] Data not available.
[3] Revised figure.
[4] Included with sandstone, crushed.
[5] Average value of products sold or used.

## EMPLOYMENT AND INJURIES

Reports submitted to the Bureau of Mines indicate that employment in the mineral industries was higher than in 1955. Employment expanded 62 percent at nonmetal mines, decreased 12 percent at quarries and mills, and decreased 14 percent at sand and gravel quarries.

Injury experience was considerably better than in 1955; frequency rate declined 45 percent below 1955. Frequency rate declined 66 percent at metal mines, declined 28 percent at quarries and mills, and declined 26 percent at nonmetal mines. Two fatal injuries occurred, the same as in 1955.

Digitized by Google

**TABLE 3.—Employment in the mineral industries, 1955–56**

| Industry | 1955 | | | 1956 [1] | | |
|---|---|---|---|---|---|---|
| | Men working daily | Average active days | Man-days worked | Men working daily | Average active days | Man-days worked |
| Metal mines | 589 | 301 | 177,071 | [2] 1,410 | [2] 338 | [2] 477,107 |
| Nonmetal mines | 1,095 | 223 | 244,409 | 1,668 | 238 | 398,832 |
| Quarries and mills | 1,645 | 230 | 377,697 | 1,552 | 215 | 333,144 |
| Sand and gravel quarries [3] | 415 | 237 | 98,475 | 386 | 219 | 84,497 |
| Total | 3,744 | 240 | 897,652 | 5,016 | 257 | 1,291,580 |

[1] Preliminary figures.
[2] Includes aluminum smelters.
[3] Excluding Government-and-contractor operations.

**TABLE 4.—Injuries in the mineral industries, 1955–56**

| Industry [1] | 1955 | | | | 1956 [2] | | | |
|---|---|---|---|---|---|---|---|---|
| | Fatal | Nonfatal | Total | Injuries per million man-days | Fatal | Nonfatal | Total | Injuries per million man-days |
| Metal mines | ------- | 90 | 90 | 508 | [3] 2 | 81 | 83 | 174 |
| Quarries and mills | 1 | 98 | 99 | 262 | ------- | 63 | 63 | 189 |
| Nonmetal mines | 1 | 76 | 77 | 315 | ------- | 92 | 92 | 232 |
| Total | 2 | 264 | 266 | 332 | 2 | 236 | 238 | 184 |

[1] Sand and gravel quarries not canvassed.
[2] Preliminary figures.
[3] Includes aluminum smelters.

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Abrasive Stones.**—Grinding pebbles, millstones, and tube-mill liners were produced in Rowan County. Except for millstones, the value of production was higher than in 1955.

**Asbestos.**—No asbestos was produced in North Carolina in 1956.

**Clays.**—The output of clays continued to increase and reached an alltime high in 1956, although its value was still 20 percent lower than in 1954. Tonnage and value were up 12 and 13 percent, respectively, above 1955. Kaolin tonnage increased 3 and value 36 percent. Miscellaneous clay exceeded 1955 figures by 12 percent in tonnage and 7 percent in value. One producer mined kaolin at 2 mines in Avery County, and 26 companies mined miscellaneous clay from 31 mines in 20 counties for use in brick and other clay products.

**Feldspar.**—Crude-feldspar production was 256,000 long tons valued at $3.2 million; feldspar was the State's fourth-ranking mineral in terms of value. Output was up 5 percent and value 46 percent, the high percentage increase in value resulting from inclusion of value of flotation feldspar for the first time. Ground-feldspar production increased 5 percent above 1955. Consolidated Feldspar Department of International Minerals & Chemical Corp. and Feldspar Corp. operated flotation mills and grinding plants and were the principal producers in 1956.

Digitized by Google

TABLE 5.—Clays sold or used by producers, 1947–51 (average) and 1952–56

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 1,270,720 | $1,606,329 | 1954 | 1,873,541 | $2,519,721 |
| 1952 | 1,357,700 | 2,080,172 | 1955 | 2,375,494 | 1,792,081 |
| 1953 | 1,466,232 | 2,534,908 | 1956 | 2,663,448 | 2,026,709 |

TABLE 6.—Crude feldspar sold or used by producers, 1947–51 (average) and 1952–56

| Year | Long tons | Value | Year | Long tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 186,615 | $1,101,847 | 1954 | 230,744 | $2,220,707 |
| 1952 | 240,364 | 2,416,031 | 1955 | 242,724 | 2,184,793 |
| 1953 | 268,042 | 3,290,495 | 1956 | 255,637 | 3,191,559 |

**Gem Stones.**—Gem stones and gem materials were collected in Avery, Buncombe, Iredell, Macon, and Mitchell Counties in 1956. Minerals reported included: Beryl, corundum, emerald, epidote, feldspar, kyanite, unakite, and quartz.

**Mica.**—The total value of sheet- and scrap-mica production declined from $4.1 million in 1955 to $3.2 million in 1956—a loss of 22 percent. Most production was sold through the General Services Administration (GSA) to the Government.

There were 69 DMEA contracts for mica active during the year; 24 of these were in force at the end of the year.

In 1956 production was reported from 259 mines in 21 counties compared with 542 mines in 22 counties in 1955. In addition, considerable production could not be identified as to county and/or mine origin. Mitchell, Yancey, Avery, Macon, Stokes, and Cleveland Counties, in the order named, each had a total production value of more than $100,000; together they accounted for 85 percent of the North Carolina mica production; these 6 counties produced 451,000 pounds of sheet valued at $1.75 million and 44,000 tons of scrap valued at $97,000.

**Olivine.**—Sales of olivine were up 27 percent in tonnage and 19 percent in value. Three mines were active in 1956—2 in Jackson County and 1 in Yancey.

**Perlite.**—Expanded perlite was produced by Carolina Perlite Co., Inc., at Salisbury from crude material shipped into North Carolina.

**Quartz.**—Consolidated Feldspar Department of International Minerals & Chemical Corp. and the Feldspar Corp. recovered quartz as a byproduct in feldspar-flotation plants in Mitchell County. In 1955–56 quartz production data are included under stone—sandstone, quartz, and quartzite. Although production was 5 percent higher than in 1955, value was 4 percent lower.

**Sand and Gravel.**—Production of sand and gravel decreased 3 percent in tonnage but increased 6 percent in value. Commercial sand and gravel made up 64 percent of the tonnage and 77 percent of the production value. Commercial sand—structural and paving—decreased 1 percent in tonnage but was 2 percent higher in value than in 1955. Commercial gravel—structural and paving—was also down

465877—58——54

Digitized by Google

**TABLE 7.—Defense Minerals Exploration Administration mica contracts in force during 1956**

| Operator | Property | County | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total value [1] | Status, Dec. 31, 1956 |
| Garland, A. T., et al. | Johnson | Ashe | March 1956 | $6,816 | Terminated. |
| Shaffer Mining Co., Inc. | Shaffer | do | October 1955 | 7,100 | Do. |
| Branch Mining Co. | Branch | Avery | do | 3,240 | Do. |
| C & D Mining Co. | C & D | do | December 1955 | 4,624 | Do. |
| Phillips, John | Ed Burleson Prospect. | do | November 1956 | 4,560 | In force. |
| Do | John Prospect | do | September 1956 | 6,940 | Do. |
| Smith, Howard | Howard Smith | do | October 1955 | 6,064 | Terminated. |
| Smith, Sam G. | Doe Hill | do | December 1955 | 5,776 | Do. |
| Do | Doe Hill No. 2 | do | July 1956 | 5,164 | In force. |
| Vance, Joe C. | Leaning Locust | do | May 1956 | 2,948 | Terminated. |
| Vance, T. B. | Shuffle Vance | do | July 1955 | 5,310 | Do. |
| Beam, J. R. | Back Frospect | Cleveland | November 1956 | 4,840 | In force. |
| Boone, R. L. | Cliff Blanton [2] | do | January 1952 | 5,650 | Terminated. |
| Buchanan Minerals, Inc. | Dream | Jackson | November 1955 | 7,200 | Do. |
| Carolina Mining Co. | Clark | do | June 1956 | 3,828 | Do. |
| Do | Hall | do | May 1956 | 2,776 | Do. |
| Do | Upper Clark | do | November 1956 | 5,240 | In force. |
| Do | Wilson Prospect | do | December 1956 | 5,068 | Do. |
| Holland, B. M. | Holland Prospects 1 and 2. | do | May 1956 | 6,576 | Terminated. |
| White, Alvin, et al. | Coward | do | June 1955 | 4,940 | Do. |
| Flynt, W. S. | Leatherman | Lincoln | May 1956 | 4,440 | Do. |
| Carolina Mining Co. | Zeb Angel | Macon | May 1955 | 5,276 | Do. |
| Crawford, E. | Setzer | do | November 1956 | 5,484 | In force. |
| Ferguson Mining Co. | Ferguson | do | February 1956 | 4,832 | Terminated. |
| Higdon, Ted | Dalton | do | July 1956 | 3,996 | Do. |
| Do | Wild Cove | do | August 1956 | 3,148 | Do. |
| Knob Mining Co. | Lyle Knob | do | March 1956 | 4,616 | Do. |
| Mica Industries, Inc. | Baird Cove [2] | do | December 1952 | 9,100 | Do. |
| Ward, A. | Harris | do | September 1955 | 6,500 | Do. |
| Black Jack Mining Co. | Black Jack | Mitchell | February 1956 | 4,416 | In force. |
| Boone, Howard | Howard Prospect | do | January 1956 | 3,288 | Terminated. |
| Buchanan, C. D. | Boone | do | December 1956 | 5,552 | In force. |
| Freeman, Paul | Hesby Edwards | do | August 1955 | 4,464 | Terminated. |
| Gouge, M., et al. | Turbyfill Prospect | do | November 1956 | 5,500 | In Force |
| Greene, W. A. | Branch | do | November 1955 | 4,116 | Terminated |
| Grindstaff, G. | Grover | do | October 1956 | 3,388 | In Force |
| Grindstaff, Roy et al. | John Conley | do | June 1955 | 4,488 | Terminated. |
| Huskins, Ed | Bill Prospects 1 and 2. | do | December 1956 | 4,996 | In force. |
| Huskins, Ed & Gage, Fred. | Briggs | do | October 1956 | 2,696 | Do. |
| Huskins, Ed | George | do | July 1956 | 4,104 | Do. |
| Do | Hesby Edwards | do | June 1956 | 3,553 | Terminated. |
| Huskins, Ed, et al. | Randolph | do | June 1955 | 5,616 | Do. |
| Huskins, P., et al. | J. W. Boone | do | October 1955 | 4,016 | Do. |
| Jarrett, J. & Grindstaff, F. | McBee Prospect | do | May 1956 | 10,662 | In force. |
| Jarrett, John, et al. | Fred Robinson | do | December 1955 | 4,220 | Terminated. |
| McKinney, B. | S. K. Kirby | do | April 1956 | 5,060 | Do. |
| Phillips, C. R. | Ed Prospect | do | June 1956 | 5,488 | Do. |
| Do | Willis | do | August 1955 | 4,304 | Do. |
| Phillips, John, et al. (Hawk Mining Co.) | Hawk | do | July 1956 | 6,760 | In force. |
| Phillips, John | May | do | August 1956 | 3,534 | Terminated. |
| Do | Queen | do | December 1955 | 5,744 | Do. |
| Do | Roby | do | September 1956 | 6,612 | In force. |
| Phillips, John, et al. | Bob Wise | do | January 1956 | 10,636 | Terminated. |
| Phillips, S. L. | Greene Prospect | do | February 1956 | 4,552 | Do. |
| Do | Old Buchanan | do | June 1956 | 4,016 | Do. |
| Richmond, Thomas, et al. | Black Bull | do | August 1956 | 4,464 | Do. |
| Sparks, B., et al. | Burleson & Gouge Prospect. | do | May 1956 | 5,192 | Do. |
| Stevenson, Ted, et al. | Stevenson | do | February 1956 | 6,716 | In force. |
| Biggerstaff, John L. | Dycus | Rutherford | July 1955 | 9,288 | Terminated. |
| Toney, F & G. | Claude Blanton | do | July 1956 | 5,412 | In force. |
| Mines & Mining, Inc. | Farlow Gap | Transylvania | July 1955 | 5,136 | Do. |

See footnotes at end of table.

Digitized by Google

**TABLE 7.—Defense Minerals Exploration Administration mica contracts in force during 1956—Continued**

| Operator | Property | County | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total value [1] | Status, Dec. 31, 1956 |
| Beam, J. R. & Phillips, J. | Little Ray | Yancey | November 1955 | $12,735 | Terminated. |
| Beam, J. R., et al | Willis Shanty | do | July 1955 | 5,824 | Do. |
| Boone, Ed | Goog Rock | do | October 1955 | 10,940 | Do. |
| Boone, J | Riddle Prospects 1, 2, and 3. | do | December 1956 | 5,472 | In force. |
| Brown, C. L. & Rathburn, G. C. | Fox | do | August 1954 | 5,788 | Do. |
| Buchanan & Snyder | Jim Riddle | do | August 1955 | 4,764 | Terminated. |
| McMurry, G., et al | Mitchell Branch | do | November 1956 | 5,876 | In force. |
| Murphy Mining Co | Murphy | do | December 1956 | 4,236 | Do. |
| Phillips, John | Laws | do | September 1955 | 5,096 | Terminated. |
| Young & Burleson | Ruby | do | July 1954 | 4,350 | Do. |

[1] Government participation, 75 percent, except where noted. Total actual expenditures by Government on terminated and certified contracts were often less than the obligated funds.
[2] Government participation, 90 percent.

**TABLE 8.—Mica sold or used by producers, 1955–56**

| Kind | | 1955 | | 1956 | |
|---|---|---|---|---|---|
| | | Quantity | Value | Quantity | Value |
| Sheet mica: | | | | | |
| Uncut punch and circle | pounds | 366,505 | $39,365 | 565,618 | $48,205 |
| Larger uncut mica | do | 3,263 | 4,094 | 41,979 | 29,335 |
| Half trim purchased by GSA | do | (1) | (1) | | |
| Full trim purchased by GSA [2] | do | 183,676 | 2,701,775 | 163,306 | 2,057,517 |
| Total sheet mica | do | 553,444 | 2,745,234 | 770,903 | 2,135,057 |
| Scrap mica: Total | short tons | 60,887 | 1,377,035 | 47,125 | 1,064,631 |
| Grand total (sheet and scrap) | do | 61,164 | 4,122,269 | 47,510 | 3,199,688 |

[1] Combined with full-trimmed to avoid disclosing individual company confidential data.
[2] Includes full-trimmed-mica equivalent of hand-cobbed mica.

1 percent in tonnage and 2 percent higher in value. Government-and-contractor sand was 4 percent lower in tonnage and 44 percent higher in value, while Government-and-contractor gravel was down 16 and 27 percent, respectively, in tonnage and value. Commercial sand and gravel was produced in 8 counties, sand only in 7 others, and gravel in 7 counties. Twenty-three companies operated 31 pits in these counties compared with 26 companies with 35 pits in 1955. Government-and-contractors produced sand in 57 counties, gravel in 8, and both sand and gravel in 10 others—a total of 75 compared with 53 in 1955.

**TABLE 9.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 6,023,153 | $3,986,630 | 1954 | 7,441,200 | $5,508,284 |
| 1952 | 8,724,748 | 5,665,169 | 1955 | 7,785,741 | 5,911,223 |
| 1953 | 6,910,982 | 4,992,991 | 1956 | 7,580,593 | 6,264,135 |

Digitized by Google

TABLE 10.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| COMMERCIAL OPERATIONS | | | | |
| Sand: | | | | |
| Structural | 1,754,898 | $1,181,645 | 1,767,319 | $1,250,830 |
| Paving | 353,580 | 222,766 | 310,153 | 188,580 |
| Filter | (1) | (1) | 6,000 | 4,000 |
| Railroad ballast | (1) | (1) | (1) | (1) |
| Other | 26,730 | 25,865 | (1) | (1) |
| Total | [2] 2,135,208 | [2] 1,430,276 | [2] 2,083,472 | [2] 1,443,400 |
| Gravel: | | | | |
| Structural | 724,452 | 1,033,325 | 881,246 | 1,309,121 |
| Paving | 1,720,307 | 1,875,511 | 1,545,957 | 1,661,208 |
| Railroad ballast and other | (1) | (1) | (1) | (1) |
| Total | [2] 2,444,759 | [2] 2,908,836 | [2] 2,427,203 | [2] 2,970,329 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | |
| Sand: | | | | |
| Structural | 146,445 | 47,844 | 58,073 | 50,026 |
| Paving | 2,187,741 | 703,210 | 2,190,367 | 1,030,310 |
| Total | 2,334,186 | 751,054 | 2,248,440 | 1,080,336 |
| Gravel: | | | | |
| Structural | 8,260 | 8,606 | 76,161 | 152,322 |
| Paving | 543,308 | 497,375 | 387,629 | 214,628 |
| Total | 551,568 | 505,981 | 463,790 | 366,950 |
| ALL OPERATIONS | | | | |
| Sand | 4,579,967 | 4,339,112 | 4,510,675 | 4,413,729 |
| Gravel | 2,885,754 | 1,257,035 | 2,712,230 | 1,447,286 |
| Undistributed | 320,020 | 315,076 | 357,688 | 403,120 |
| Grand total | 7,785,741 | 5,911,223 | 7,580,593 | 6,264,135 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Incomplete, portion not included is combined with "Undistributed."

**Stone.**—Total stone production was slightly below that of 1955. Basalt and marble showed large gains in tonnage and value, while limestone and sandstone (including quartz) were lower than in 1955. Crushed granite tonnage increased 6 percent and its value 4 percent. Crushed commercial granite was 3 percent higher in tonnage and value and Government-and-contractor granite was up 29 percent in tonnage and 14 percent in value. No miscellaneous stone was reported in 1956.

Stone ranks first among North Carolina minerals in both total tonnage and value. Granite was quarried in 27 counties, limestone in 5, basalt in Union County, marble in Cherokee, and sandstone in Mitchell (byproduct quartz) and Swain Counties. Excluding quartz, 22 operators produced commercial stone from 37 quarries, including 29 granite and 6 limestone quarries and 1 traprock and 1 sandstone quarry. North Carolina State Highway and Public Works Commission produced crushed stone from 18 granite quarries and 1 limestone quarry, and the United States Forest Service quarried a minor tonnage of limestone. Noncommercial stone comprised 11 percent of the tonnage and 10 percent of the value of the total crushed-stone production in 1956.

Digitized by Google

TABLE 11.—Crushed granite sold or used by producers, 1948–51 (average) and 1952–56

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 4,670,346 | $6,691,472 | 1954 | 6,990,173 | $9,897,038 |
| 1952 | 6,213,443 | 8,949,769 | 1955 | 7,878,491 | 11,004,765 |
| 1953 | 6,428,416 | 9,165,805 | 1956 | 8,351,953 | 11,468,086 |

**Talc and Pyrophyllite.**—Crude-talc and pyrophyllite production totaled 125,000 tons valued at $529,000—virtually the same tonnage as in 1955 but 7 percent lower in value. Ground talc and pyrophyllite also remained virtually unchanged in tonnage, with their value down 8 percent. Sawed talc, on the other hand, increased 16 percent in tonnage and 27 percent in value. Pyrophyllite was mined in Alamance, Moore, Orange, and Randolph Counties and talc in Cherokee County.

TABLE 12.—Talc and pyrophyllite production, 1947–51 (average) and 1952–56

| Year | Crude mined | | Sales (crude, sawed, and ground) | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 104,389 | (1) | 103,718 | $1,555,002 |
| 1952 | 116,722 | (1) | 115,481 | 1,771,518 |
| 1953 | 119,341 | $578,239 | 118,614 | 1,909,027 |
| 1954 | 112,704 | 388,428 | 105,384 | 1,771,778 |
| 1955 | 125,206 | 571,689 | 120,885 | 1,999,560 |
| 1956 | 125,487 | 529,205 | 121,782 | 1,921,834 |

[1] Data not available.

**Vermiculite.**—No crude vermiculite was mined in the State in 1956. Exfoliated vermiculite was produced from crude shipped into the State by Alabama Vermiculite Co., Sylvia; American Vermiculite Co., Altapass; Roy M. Biddle, Franklin; and Zonolite Co., Highpoint. Although quantity sold or used declined 17 percent, the value remained virtually the same as in 1955.

## METALS

**Beryllium Concentrate.**—Beryl production was 3 tons valued at $1,800; it came from 5 or more counties, including Alexander, Ashe, Avery, Mitchell, and Yancey.

**Gold, Silver, Copper, and Lead.**—H & H Mines, Inc., of Enfield (Halifax County) greatly increased production in 1956. Besides copper, 10 tons of lead, 882 ounces of gold, and 753 ounces of silver were recovered. Appalachian Sulfides, Inc., continued development at the Ore Knob mine in Ashe County. During the year the shaft was sunk 461 feet and completed at 1,037 feet. Drifting and crosscutting totaled 1,688 feet and diamond drilling 6,377 feet. A flotation mill with 700 tons daily capacity was under construction. Completed during the year were: Assay office, hoist and compressor building, changehouse, warehouse, machine and electric shops, and office.

**Tungsten Concentrate.**—Production of tungsten came from the Hamme mine in Vance County owned by the Tungsten Mining Co.

Digitized by Google

A total of 2,858 short tons (60-percent $WO_3$ basis) of concentrate was recovered in 1956—an increase of 8 percent above 1955. Sales were 2,732 tons (60-percent $WO_3$ basis) compared with 2,609 tons in the previous year. The value of shipments declined 15 percent below 1955, because smaller tonnages were sold to the Government for stockpiling in 1956.

Two DMEA contracts were active during the year; Carolina Tungsten Mining Co. explored the Furniss mine in Cabarrus County under a contract for $26,400, and Tungsten Mining Co. conducted exploration at the Hamme mine under a contract for $246,600; Government participation was 75 percent in both contracts.

**TABLE 13.—Tungsten concentrate produced and shipped, 1947–51 (average) and 1952–56**

| Year | Produced | | Shipped from mines | |
|---|---|---|---|---|
| | Short tons, 60-percent $WO_3$ | Units | Short tons, 60-percent $WO_3$ | Units |
| 1947–51 (average) | 917 | 55,002 | 911 | 54,658 |
| 1952 | 1,248 | 74,904 | 1,254 | 75,226 |
| 1953 | [1] 2,146 | 128,645 | 2,074 | 124,455 |
| 1954 | [1] 2,519 | 151,166 | 2,538 | 152,296 |
| 1955 | [1] 2,638 | 158,304 | 2,609 | 156,537 |
| 1956 | 2,858 | 171,451 | 2,732 | 163,913 |

[1] Revised figure.

## REVIEW BY COUNTIES

Of North Carolina's 100 counties, mineral production was reported from 96, with Mitchell, Guilford, Wilson, Surrey, Cleveland, and Rowan leading; each produced over $1 million. In addition to the detailed county production listed below, 264,000 pounds of sheet mica, 3,000 tons of scrap mica, a considerable quantity of crude feldspar, 657,000 tons of sand and gravel, 229,000 tons of crushed granite, 290 tons of crushed limestone, and a small quantity of gem stones were produced; all these were of undetermined county origin.

**Alamance.**—Boren & Harvey (Snow Camp mine) mined 14,700 tons of pyrophyllite for refractory purposes. North Carolina State Highway and Public Works Commission (Bason quarry) crushed 29,700 tons of granite for concrete aggregate and roadstone. Hanford Brick Co. Inc. mined miscellaneous clay for heavy clay products; production increased 25 percent over 1955.

**Alexander.**—A. H. DeVier (Ted Warren mine) produced 78 pounds of sheet mica.

**Anson.**—W. R. Bonsal Co., lessees of B. V. Hedrick, and the State highway commission mined structural, paving and railroad-ballast sands and structural, paving, railroad-ballast, and other gravels; production increased 7 percent over 1955. The State highway commission (Sugartown quarry) crushed 32,700 tons of granite for concrete aggregate and roadstone.

Digitized by Google

**TABLE 14.—Value of mineral production in North Carolina, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Alamance | $158,122 | $138,410 | Talc, granite, miscellaneous clay, sand and gravel. |
| Alexander | (2) | 11,856 | Sand and gravel, mica, beryl. |
| Alleghany | 7,635 | 3,523 | Sand and gravel. |
| Anson | (2) | (2) | Sand and gravel, granite. |
| Ashe | (2) | (2) | Sand and gravel, mica, beryl. |
| Avery | 900,013 | 989,311 | Kaolin, mica, feldspar, sand and gravel, gem stones, beryl. |
| Beaufort | 45,872 | 50,426 | Sand and gravel. |
| Bertie | ---------- | 1,530 | Do. |
| Bladen | 2,050 | 62,050 | Do. |
| Brunswick | 15,320 | 40,900 | Do. |
| Buncombe | (2) | (2) | Sand and gravel, granite, mica, feldspar, gem stones. |
| Burke | (2) | 64,254 | Sand and gravel, mica. |
| Cabarrus | (2) | (2) | Sand and gravel. |
| Caldwell | (2) | (2) | Granite, sand and gravel, mica. |
| Camden | ---------- | 8,000 | Sand and gravel. |
| Carteret | ---------- | 1,500 | Do. |
| Caswell | 897,145 | 748,696 | Granite, sand and gravel. |
| Catawba | 17,756 | (2) | Granite, miscellaneous clay, sand and gravel. |
| Chatham | 231,027 | 219,388 | Miscellaneous clay, granite. |
| Cherokee | 213,302 | 294,122 | Marble, talc, granite. |
| Chowan | ---------- | 25,000 | Sand and gravel. |
| Clay | 10 | ---------- | |
| Cleveland | (2) | (2) | Limestone, mica, sand and gravel, miscellaneous clay. |
| Columbus | 9,859 | 81,000 | Sand and gravel. |
| Craven | 11,250 | 7,500 | Do. |
| Cumberland | (2) | 363,255 | Sand and gravel, miscellaneous clay. |
| Currituck | ---------- | 5,500 | Sand and gravel. |
| Dare | ---------- | 15,000 | Do. |
| Davidson | 140,900 | 109,200 | Sand and gravel, miscellaneous clay. |
| Davie | 24,000 | 36,540 | Sand and gravel, feldspar. |
| Duplin | 2,660 | 2,320 | Sand and gravel. |
| Durham | (2) | (2) | Granite, miscellaneous clay. |
| Forsyth | 816,858 | 583,635 | Granite, sand and gravel. |
| Franklin | 2,700 | 5,638 | Sand and gravel. |
| Gaston | 36,353 | 61,598 | Mica, miscellaneous clay, sand and gravel. |
| Gates | ---------- | 7,000 | Sand and gravel. |
| Granville | 27,533 | 23,784 | Granite, sand and gravel. |
| Greene | 20,700 | 45,000 | Sand and gravel. |
| Guilford | 2,938,857 | (2) | Granite, miscellaneous clay, sand and gravel. |
| Halifax | 7,522 | 36,543 | Gold, lead, sand and gravel, copper, silver. |
| Harnett | (2) | (2) | Sand and gravel. |
| Haywood | (2) | (2) | Granite, sand and gravel, mica. |
| Henderson | 330,271 | 250,100 | Limestone, miscellaneous clay. |
| Hertford | ---------- | 6,188 | Sand and gravel. |
| Hoke | (2) | (2) | Do. |
| Hyde | ---------- | 31,538 | Do. |
| Iredell | (2) | 30,401 | Sand and gravel, gem stones. |
| Jackson | (2) | (2) | Olivine, mica. |
| Johnston | 15,000 | 26,000 | Sand and gravel. |
| Jones | 22,941 | 24,675 | Do. |
| Lee | 253,150 | 257,228 | Miscellaneous clay, sand and gravel. |
| Lenoir | 94,650 | 142,805 | Sand and gravel. |
| Lincoln | (2) | (2) | Mica, sand and gravel. |
| Macon | 660,608 | (2) | Mica, sand and gravel, gem stones. |
| Madison | (2) | (2) | Feldspar. |
| Martin | ---------- | 15,058 | Sand and gravel. |
| McDowell | (2) | (2) | Sand and gravel, limestone, mica. |
| Mecklenburg | ---------- | (2) | Granite. |
| Mitchell | [3] 3,695,889 | 3,969,729 | Feldspar, mica, sandstone, beryl, gem stones. |
| Montgomery | 126,211 | 114,134 | Miscellaneous clay, sand and gravel. |
| Moore | 438,294 | (2) | Pyrophyllite, sand and gravel. |
| Nash | 5,215 | (2) | Miscellaneous clay, sand and gravel. |
| New Hanover | (2) | 15,000 | Sand and gravel. |
| Northampton | (2) | 241,766 | Sand and gravel, miscellaneous clay. |
| Onslow | (2) | (2) | Limestone, sand and gravel. |
| Orange | 114,540 | (2) | Pyrophyllite, granite. |
| Pamlico | ---------- | 750 | Sand and gravel. |
| Pasquotank | ---------- | 16,200 | Do. |
| Pender | 4,950 | 1,340 | Do. |
| Perquimans | ---------- | 4,000 | Do. |
| Person | 9,050 | 6,068 | Do. |
| Pitt | 33,750 | 54,296 | Do. |
| Polk | 5,800 | 25,000 | Do. |
| Randolph | (2) | (2) | Granite, pyrophyllite, sand and gravel. |

See footnotes at end of table.

Digitized by Google

TABLE 14.—Value of mineral production in North Carolina, 1955–56, by counties [1]—Continued

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Richmond | | $5,120 | Sand and gravel. |
| Robeson | $8,000 | 28,500 | Do. |
| Rockingham | 193,414 | 208,831 | Granite, miscellaneous clay, mica, sand and gravel. |
| Rowan | 1,230,780 | 1,220,936 | Granite, miscellaneous clay, sand and gravel, abrasive stones. |
| Rutherford | 88,916 | 171,369 | Sand and gravel, mica, beryl. |
| Sampson | 60,610 | 123,854 | Miscellaneous clay, sand and gravel. |
| Scotland | 12,000 | 15,898 | Sand and gravel. |
| Stanly | [3] 163,545 | 234,490 | Miscellaneous clay, granite. |
| Stokes | 177,283 | 253,892 | Mica, sand and gravel, miscellaneous clay. |
| Surry | (2) | (2) | Granite, sand and gravel. |
| Swain | (2) | (2) | Limestone, feldspar, sandstone. |
| Transylvania | (2) | 170 | Mica. |
| Tyrrell | | 300 | Sand and gravel. |
| Union | (2) | (2) | Traprock, granite, miscellaneous clay, sand and gravel. |
| Vance | (2) | (2) | Tungsten, granite. |
| Wake | (2) | (2) | Granite, sand and gravel. |
| Washington | | 1,766 | Sand and gravel. |
| Watauga | (2) | (2) | Sand and gravel, mica, granite. |
| Wayne | 54,266 | 140,573 | Sand and gravel. |
| Wilkes | 13,752 | (2) | Sand and gravel, granite, mica. |
| Wilson | 1,454,756 | 1,774,309 | Granite, sand and gravel. |
| Yadkin | (2) | (2) | Do. |
| Yancey | [3] 901,757 | 765,027 | Mica, sand and gravel, feldspar, olivine, beryl. |
| Undistributed | [3] 24,512,158 | 25,765,483 | |
| Total | 41,210,000 | 39,985,000 | |

[1] The following counties are not listed because no production was reported: Edgecombe, Graham, and Warren.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Revised figure.

**Ashe.**—McCrary Construction Service and the State highway commission mined paving gravel; production increased considerably over 1955 owing to initial production by McCrary. Hawkins Mining Co. (Duncan No. 2 mine), Johnson Mining Co. (Johnson mine), and Hayden Ollis (Osborne mine) mined 16,000 pounds of sheet mica. Appalachian Sulfides, Inc. continued underground development and surface-plant construction at the Ore Knob copper mine.

Two DMEA mica contracts were in force.

**Avery.**—Harris Clay Co. (Gusher Knob and Kaolin mines) mined kaolin for whiteware, floor and wall tile, refractories, plastics, and artificial abrasives; production increased 8 percent over 1955. Over 38 companies mined 276,000 pounds of sheet mica and 6,800 tons of scrap mica; leading producers of sheet mica were: Elk Mica Miners (Elk mine), Dellinger Bros. (Charlie Ridge mine), Donald Autrey (Mill Race mine), and Frank Burleson (Emmons Knob mine); the leading producer of scrap mica was Harris Clay Co. (Gusher Knob and Kaolin mines). Nine DMEA mica contracts were active.

The Feldspar Corp. operated the Buchanan, Dugger, Hughes, and Pine Patch mines for feldspar; production more than doubled that in 1955. Warren Duncan, W. M. Johnson, and F. O. Scruggs produced a small quantity of gem stones.

**Buncombe.**—Bell Sand Co., Grove Stone & Sand Branch of B. V. Hedrick Gravel & Sand Co., and James Harris (Reed & Abee mine) ...ed structural and paving sands and structural, paving and railroad ...ast gravels; production declined 26 percent below 1955, owing to ...creased production from the Reed & Abee mine. The State highway commission (Weaverville quarry) crushed 36,600 tons of granite for concrete aggregate and roadstone.

Digitized by Google

**TABLE 15.—Sand and gravel produced by the State highway commission in 1956, by counties**

| County | Sand (short tons) | Gravel (short tons) | Use |
|---|---|---|---|
| Alamance | 1,000 | | Paving sand. |
| Alexander | 36,000 | | Do. |
| Alleghany | | 1,600 | Paving gravel. |
| Anson | (1) | (1) | Paving sand and gravel. |
| Ashe | | (1) | Paving gravel. |
| Avery | 600 | | Paving sand. |
| Beaufort | 67,200 | | Do. |
| Bertie | 5,100 | | Do. |
| Bladen | 56,000 | 6,100 | Paving sand and paving gravel. |
| Brunswick | | 40,900 | Paving gravel. |
| Burke | 142,000 | 30,000 | Paving sand and paving gravel. |
| Cabarrus | (1) | (1) | Paving sand and gravel. |
| Caldwell | 5,300 | | Paving sand. |
| Camden | 32,000 | | Do. |
| Carteret | 2,000 | | Do. |
| Catawba | 54,000 | | Do. |
| Chowan | 100,000 | | Do. |
| Cleveland | 69,800 | | Do. |
| Columbus | 81,000 | | Do. |
| Craven | 10,000 | | Do. |
| Cumberland | (1) | (1) | Structural, paving and railroad ballast sand and structural and paving sand. |
| Currituck | 22,000 | | Paving sand. |
| Dare | 56,000 | | Do. |
| Davidson | 22,000 | 136,000 | Paving sand and paving gravel. |
| Davie | 61,000 | | Paving sand. |
| Duplin | | 23,200 | Paving gravel. |
| Forsyth | (1) | | Structural and paving sand. |
| Franklin | 11,300 | | Paving sand. |
| Gaston | 48,400 | | Do. |
| Gates | 28,000 | | Do. |
| Granville | 3,000 | | Do. |
| Greene | 60,000 | | Do. |
| Guilford | 5,500 | 10,000 | Paving sand and paving gravel. |
| Halifax | 5,400 | | Paving sand. |
| Harnett | (1) | (1) | Structural, paving, filler, and ballast sand, and structural, paving sand and gravel, and railroad ballast gravel. |
| Hertford | 20,600 | | Paving sand. |
| Hyde | 56,200 | | Do. |
| Iredell | 101,300 | | Do. |
| Johnston | 26,000 | | Do. |
| Jones | (1) | (1) | Paving sand and paving gravel. |
| Lee | 1,800 | | Paving sand. |
| Lenoir | (1) | (1) | Structural and paving sand and structural gravel. |
| Lincoln | 41,900 | | Paving sand. |
| Martin | 52,200 | | Do. |
| Montgomery | 14,000 | 22,100 | Paving sand and paving gravel. |
| Moore | (1) | | Structural and paving sand. |
| Nash | (1) | | Paving sand. |
| Northampton | (1) | (1) | Structural and paving sand and structural gravel. |
| Onslow | | (1) | Paving gravel. |
| Pamlico | 1,000 | | Paving sand. |
| Pasquotank | 60,000 | | Do. |
| Pender | 13,400 | | Do. |
| Perquimans | 16,000 | | Do. |
| Person | 9,300 | | Do. |
| Pitt | 72,400 | | Do. |
| Polk | 25,000 | | Do. |
| Richmond | 5,500 | 3,800 | Paving sand and paving gravel. |
| Robeson | 114,000 | | Paving sand. |
| Rockingham | (1) | | Paving gravel. |
| Rowan | 38,000 | | Paving sand. |
| Sampson | | 22,200 | Paving gravel. |
| Scotland | | 15,900 | Do. |
| Stokes | 82,000 | | Paving sand. |
| Surry | | (1) | Paving gravel. |
| Tyrrell | 1,200 | | Paving sand. |
| Union | 8,000 | | Do. |
| Wake | 3,600 | | Do. |
| Washington | 7,100 | | Do. |
| Watauga | (1) | (1) | |
| Wayne | (1) | | Structural and paving sand. |
| Wilkes | 20,000 | 41,200 | Paving sand and paving gravel. |
| Wilson | 30,600 | | Paving sand. |
| Yadkin | 4,400 | 44,000 | Paving sand and paving gravel. |

[1] See county review.

Digitized by Google

Seven companies mined 2,000 pounds of sheet mica; the leading producer was S & B Mining Co. (Watkins mine). The Feldspar Corp. (Arrowood mine) mined feldspar; production increased 39 percent over 1955. R. A. Campbell and John Vance produced a small quantity of gem stones.

**Burke.**—Buchanan & Beam Mining Co. (Britton mine), R. P. Vanhorn (Vanhorn mine), and D. A. Young (Young mine) mined 2,900 pounds of sheet mica and 9 tons of scrap mica.

**Cabarrus.**—The State highway commission and Lee White Gravel Pit (Concord mine) mined paving sand and gravel; production declined 56 percent below 1955.

DMEA activity consisted of a project for tungsten by Carolina Tungsten Mining Co. amounting to $26,400 at the Furniss mine.

**Caldwell.**—Clement Bros. Inc. (Caldwell quarry), crushed granite for concrete and roads; production was nearly 4 times that of 1955. Bowman Bros. (Bowman mine) mined 200 pounds of sheet mica.

**Caswell.**—Lambert Bros. (Danville quarry) and the State highway commission (Ivy Bluff quarry) crushed 587,000 tons of granite for concrete aggregate and roadstone.

**Catawba.**—Superior Stone Co. (Hickory quarry) crushed granite for concrete aggregate and roadstone. Statesville Brick Co. mined 119,000 tons of miscellaneous clay for heavy clay products.

**Chatham.**—Boren Clay Products Co., Chatham Brick & Tile Co. Inc., Cherokee Brick Co., and Pomona Terra Cotta Co. mined 298,000 tons of miscellaneous clay for heavy clay products. The State highway commission (Goldston quarry) crushed 21,100 tons of granite for concrete aggregate and roadstone.

**Cherokee.**—Columbia Marble Co. (Pleasant Valley quarry) quarried dimension marble for exterior, dressed building stone, and cut and dressed monumental stone and crushed marble for terrazzo and agstone; production of dimension marble was 73 percent higher than in 1955, and production of crushed marble increased 59 percent. The Hitchcock Corp. (Nancy Jordan mine) and Minerals & Metals Corp. (Mulberry Gap mine) mined talc for crayons, insecticides, rubber, textiles, toilet preparations, and other uses. The State highway commission (McDonald quarry) mined 5,100 tons of crushed granite for concrete aggregate and roadstone.

**Cleveland.**—Superior Stone Co. (Kings Mountain quarry) crushed limestone for concrete aggregate and roadstone; production decreased 13 percent below 1955. Eighteen individuals mined 4,900 pounds of sheet mica; Ellis Mining Co. (Magness mine), W. H. Humphries and Pink Loveless (Fred Blanton mine), and Sparks & Buchanan (Carpenter mine) were the leading producers. Kings Mountain Mica Co. Inc. (Patterson mine) mined scrap mica. Two DMEA contracts were in force. Bennett Brick & Tile Co. (Kings Mountain mine) mined 21,800 tons of miscellaneous clay for heavy clay products.

**Cumberland.**—Becker County Sand & Gravel Co. (Fayetteville mine), Bryan Rock & Sand Co. (Linden mine), and State highway commission mined 383,000 tons of structural, paving and railroad-ballast sands and structural and paving gravels. Ideal Brick Co. (Linden mine) mined 52,000 tons of miscellaneous clay for heavy clay products.

Digitized by Google

**Davidson.**—Cunningham Brick Co. (Thomasville mine) mined 52,000 tons of miscellaneous clay for heavy clay products.

**Davie.**—Clinchfield Sand & Feldspar Co. opened the Porter-Strand mine and produced 750 tons of feldspar.

**Durham.**—Nello L. Teer Co. crushed granite for concrete and roads; production decreased 11 percent below 1955. Borden Brick & Tile Co. mined 47,000 tons of miscellaneous clay for heavy clay products.

**Forsyth.**—W. E. Graham & Sons (Graham quarry) and Piedmont Quarry Co. (Salem quarry) crushed 474,000 tons of granite for concrete aggregate and roadstone. Ira Pope & Sons, Inc. (Yadkin River mine), and the State highway commission mined 112,000 tons of structural and paving sand.

**Gaston.**—Four companies mined 11,700 pounds of sheet mica; the leading producers were: Arlind Crowder (Huskins mine), Esper Willis (Gant mine), and Garnet Mining Co. (Self and Kings Mountain mines). Kendrick Brick & Tile Co. (Mount Holly mine) mined 29,600 tons of miscellaneous clay for heavy clay products.

**Granville.**—The State highway commission crushed 11,000 tons of granite for concrete aggregate and roadstone and mined 3,000 tons of paving sand.

**Guilford.**—Buchanan Stone Co. (Buchanan quarry), Pioneer Quarries Co. (Guil quarry), State highway commission (Pearman quarry), and Superior Stone Co. (Jamestown, Pomona and Reuben quarries) crushed granite for concrete aggregate roadstone and stone sand; production decreased 21 percent. Boren Clay Products Co. (Pleasant Garden mine) mined 87,500 tons of miscellaneous clay for heavy clay products. Zonolite Co. operated its High Point plant for exfoliated vermiculite.

**Halifax.**—H & H Mines, Inc. operated the H & H mine, and recovered 882 fine ounces of gold and 753 fine ounces of silver, as well as copper and lead.

**Harnett.**—Becker County Sand & Gravel Co. (Senter mine), Southern Sand & Gravel Co., and the State highway commission mined structural, paving, filler, and railroad-ballast sands and structural, paving, and railroad-ballast gravels; production expanded 28 percent over 1955.

**Haywood.**—Clement Bros., Inc., opened a new quarry and crushed granite for concrete aggregate and roadstone. Sale & Alexander mined structural and paving sands and structural, paving, and other gravels; production decreased 12 percent. Everett L. Poston (Shining Rock mine) and William Willis (Big Ridge mine) mined a small quantity of sheet mica.

**Henderson.**—Cogdill Limestone Co., Inc. (Cogdill quarry), and Fletcher Limestone Co. (Fletcher quarry) crushed 209,000 tons of limestone for concrete aggregate and roadstone. Etowah Brick Co., Inc. (Etowah mine), mined 23,300 tons of miscellaneous clay for heavy clay products.

**Hoke.**—Cumberland Gravel & Sand Co. (Vass mine) mined structural sand and gravel; production expanded 36 percent.

**Iredell.**—R. A. Campbell produced a small quantity of gem stones.

**Jackson.**—Harbison-Walker Refractories Co. (Addie mine) and Balsam Gap Co. (Balsam Gap mine) expanded production of olivine by 22 percent over 1955. Ten companies mined 4,000 pounds of

Digitized by Google

sheet mica and 149 tons of scrap mica. Leading producers of sheet mica were Southern Mineral Development Co., Inc. (Buzzard Roost mine), Carolina Mining Co. (Eagle Cope mine), and Buchanan Minerals, Inc. (Dream No. 2 mine). Carolina Mining Co. (Clark mine) was the only producer of scrap mica. Seven DMEA mica contracts were in force.

**Jones.**—The Simmons Marl & Lime Co. (Simmons mine) and the State highway commission mined 12,000 tons of paving sand and 12,500 tons of paving gravel.

**Lee.**—The Sanford Brick & Tile Co. (Colon mine) and Borden Brick & Tile Co. (Sanford mine) mined miscellaneous clay for heavy clay products.

**TABLE 16.—Miscellaneous clay sold or used by producers in Lee County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 262,936 | $252,741 | 1954 | 360,831 | $418,564 |
| 1952 | 348,600 | 397,200 | 1955 | 415,000 | 253,150 |
| 1953 | 314,000 | 378,800 | 1956 | 442,500 | 256,700 |

**Lenoir.**—Barrus Construction Co. (Kinston mine) and the State highway commission mined 164,000 tons of structural and paving sands and 8,500 tons of structural gravel.

**Lincoln.**—Eight companies mined sheet mica; the leading producers were Harold & Guy Brown (Brown mine) and A. W. Warlick (Warlick mine).

The DMEA activity consisted of a prospect for sheet mica by W. S. Flynt at the Leatherman mine, amounting to $4,440.

**Macon.**—Eighteen companies mined 18,200 pounds of sheet mica; the leading producers were Harris Mining Co. (Harris mine), N. E. Mashburn (Bowers, Bruce, and Rock Cut mines), Mica Development Corp. (Chalk Hill mine), and Parks Brendle (George Reid mine). Four companies mined scrap mica, but the leading producer was Macon Mining Co. (Shepherds Knob mine). Harp Block Co. mined 3,400 tons of structural sand. R. A. Campbell, Warren Duncan, and W. M. Johnson mined a small quantity of gem stones. Roy M. Biddle operated the Franklin plant for exfoliated vermiculite.

Eight DMEA mica contracts were in force.

**Madison.**—The Feldspar Corp. produced a small quantity of feldspar at the Metcalf mine.

**McDowell.**—Becker County Sand & Gravel Co. (Marion mine) mined structural and paving sands and structural, paving and railroad-ballast gravels. The State highway commission (Woodlawn quarry) crushed 82,000 tons of limestone for concrete aggregate and roadstone. A small quantity of sheet mica was mined by Bennett & Edwards (Wiseman mine).

**Mecklenburg.**—The State highway commission and Superior Stone Co. (Charlotte quarry) crushed granite for concrete aggregate and roadstone.

**Mitchell.**—Six companies mined feldspar; the leading producers were International Minerals & Chemical Corp. (Hawkins and Kona

Digitized by Google

mines), The Feldspar Corp. (Bear Creek, Bennett, Dogwood Flats, Gopher, Neilus, Poteat, Wiseman, and Young mines). Feldspar production increased 1 percent over 1955. Mica was produced at 77 mines. The leading producers of sheet mica were: R & B Mining Co. (R. B. Phillips mine), Sink Hole Miners (Sink Hole mine), Cook Mining Co. (Robinson mine), W. K. Buchanan (Martin mine), Claude Buchanan (Horton Rock mine), J. E. Wilson (Bee Ridge mine), Birch Mining Co. (Birch mine), T-Cut Mining Co. (T-Cut mine), Abernathy Mining Co. (Abernathy mine), and Mountain Mining Co. (Jimmy Cut mine). The leading producers of scrap mica were: The Feldspar Corp. (Poteat and Wiseman mines), International Minerals & Chemical Corp. (Kona and Hawkins mines), and English Mica Co. (Martin mine). Sheet-mica production totaled 89,700 pounds and scrap-mica production 11,800 tons.

International Minerals & Chemical Corp. and the Feldspar Corp. recovered crushed sandstone (quartz) from feldspar milling; production increased 5 percent over 1955. Linten B. Greene and the Weatherspoon Mining Co. mined 2,200 pounds of beryl. R. A. Campbell, Warren Duncan, F. O. Scruggs, and John Vance produced a small quantity of gem stones. American Vermiculite Co. operated the Altapass plant for exfoliated vermiculite.

Twenty nine DMEA exploration contracts for mica were in force in Mitchell County.

**Montgomery.**—Mt. Gilead Brick Co. mined 150,000 tons of miscellaneous clay for heavy clay products. Harrison Sand Pit produced 56,500 tons of structural sand.

**Moore.**—Glendon Pyrophyllite Co. and Standard Mineral Co., Inc., mined pyrophyllite for asphalt filler, ceramic, insecticide, paint, refractory, rubber, and other uses. Aberdeen Sand & Gravel Co. (Aberdeen mine), Bryan Rock & Sand Co. (Montrose and West End mines), Monroe Sand Pit, Pleasants Sand & Supply Co., and the State highway commission mined structural and paving sands.

**Nash.**—Nash Brick Co. mined miscellaneous clay for heavy clay products; production decreased 18 percent below 1955. The State highway commission mined paving sand.

**New Hanover.**—Mrs. E. L. Robbins mined 15,000 tons of sand for fertilizer filler.

**Northampton.**—Grant Brick Works mined 12,000 tons of miscellaneous clay for heavy clay products. Bryan Rock & Sand Co. (Garysburg mine) and the State highway commission mined 80,200 tons of structural and paving sands and 181,500 tons of structural gravel.

**Onslow.**—Superior Stone Co. (Belgrade quarry) crushed limestone for concrete aggregate and roadstone. The State highway commission mined paving gravel.

**Orange.**—Boren & Harvey (Hillsboro mine) mined pyrophyllite for refractory uses. The State highway commission crushed 11,500 tons of granite for concrete aggregate and roadstone. Duke University prepared 700 tons of rough construction granite.

**Randolph.**—The State highway commission (Parks Crossroad and Glenola quarries) crushed granite for concrete aggregate and roadstone, as well as paving sand. Carolina Pyrophyllite Co., Inc. (Gerhardt mine), mined pyrophyllite for ceramic uses.

Digitized by Google

**Rockingham.**—The State highway commission (Newman quarry) crushed granite for concrete aggregate and roadstone and a small quantity of paving sand; Roanoke-Webster Brick Co., Inc. (Draper mine), and Pine Hall Brick & Pipe Co. (Madison mine) mined miscellaneous clay for heavy clay products. H. A. Knight, Sr. (Knight mine), and John Blalock (Smith mine) mined 700 pounds of sheet mica.

**Rowan.**—Superior Stone Co. (Woodleaf quarry) crushed granite for concrete aggregate, roadstone, and railroad ballast; production decreased 4 percent below 1955. Carolina Tufflite Co. and Isenhour Brick & Tile Co. mined miscellaneous clay for lightweight aggregate and heavy clay products; production increased 9 percent over 1955. G. M. Earnhardt (Rockwell quarry), Harris Granite Quarries Co. (Balfour, Collins, and Shuping quarries), and H. P. Stirewalt quarried dimension granite for rough construction, rubble, and rough architectural building stone, rough monumental stone, paving blocks, curbing and flagging; production increased 57 percent over 1955. Gardner Granite Works produced millstones. Harris Granite Quarries Co. produced 300 tons of tube-mill liners and 150 tons of grinding pebbles. Carolina Perlite Co., Inc., operated its expanded perlite mill; production decreased 16 percent.

**Rutherford.**—A. R. Thompson, contractor, mined 216,300 tons of paving gravel. Ben Bumgarner (Sherwood Withrow mine), Mace & Son (Mace mine), and Frank W. Phillips (Dycus mine) mined 7,700 pounds of sheet mica.

Two DMEA contracts were in force.

**Sampson.**—Patterson Brick Co. and Sampson Brick Co. mined 205,800 tons of miscellaneous clay for heavy clay products.

**Stanly.**—Carolina Solite Corp. (Solite Site mine), Stanly Shale Products, Inc. (Norwood mine), and Yadkin Brick Yards, Inc., mined 340,000 tons of miscellaneous clay for lightweight aggregates and heavy clay products. The State highway commission (Aquadale quarry) crushed 30,000 tons of granite for concrete aggregate and roadstone.

**Stokes.**—Hawkins Mining Co. (Hawkins mine), L & M Mining Co. (Steel mine), and Spencer Mining Co. (Spencer mine) mined 22,900 pounds of sheet mica. Spencer Mining Co. (Spencer mine) mined 50 tons of scrap mica. Pine Hall Brick & Pipe Co. (Nos. 1 and 2 mines) mined 77,000 tons of miscellaneous clay for heavy clay products.

**Surry.**—North Carolina Granite Corp. quarried dimension granite for rough construction, rubble, rough architectural building stone, dressed construction and dressed architectural building stone, rough and dressed monumental stone, paving blocks, and curbing and flagging; production declined 13 percent. North Carolina Granite Corp. (Mt. Airy quarry) crushed granite for riprap, concrete aggregate, and roadstone, and other uses; production increased 55 percent. W. E. Graham & Sons (Mt. Airy mine) and the State highway commission mined paving gravel; production increased 80 percent.

**Swain.**—Nantahala Talc & Limestone Co. (Hewitt quarry) crushed 91,000 tons of limestone for concrete aggregate, roadstone, and agstone. The Feldspar Corp. (Akexander mine) mined feldspar; production decreased 13 percent. J. O. DeBord (Needmore quarry) quarried 300 tons of dimension sandstone for flagging.

Digitized by Google

**Transylvania.**—Thomas Kitchen (Kitchen mine), James E. Moore (Broom mine), and Fred Wilson (Bee Tree No. 1 mine) mined 21 pounds of sheet mica.

**Union.**—Superior Stone Co. (Bakers quarry) crushed traprock for concrete aggregate and roadstone; production increased 34 percent. The State highway commission crushed 100,000 tons of granite for concrete aggregate and roadstone. Kendrick Brick & Tile Co. (Monroe mine) mined 122,000 tons of miscellaneous clay for heavy clay products.

**Vance.**—Tungsten Mining Corp. (Hamme mine) shipped 2,300 tons of tungsten concentrate. Greystone Granite quarries (Greystone quarry) crushed granite for concrete aggregate and roadstone.

DMEA activity consisted of a contract with Tungsten Mining Corp. in the amount of $246,600.

**Wake.**—Bryan Rock & Sand Co. (Crabtree and Rolesville quarries) and Nello L. Teer Co. (Raleigh quarry) crushed granite for concrete aggregate, roadstone, and other uses; production was about the same as in 1955.

**Watauga.**—McCrary Contracting Service and the State highway commission mined paving sand and paving gravel; production was more than eight times that of 1955, due to initial production of McCrary Contracting Service. Southern Mineral Development Co., Inc. (Old Susie mine), mined sheet mica. The State highway commission crushed 8,700 tons of granite for concrete aggregate and roadstone.

**Wayne.**—Bryan Rock & Sand Co. (Goldsboro mine) and the State highway commission mined 159,200 tons of structural and paving sand.

**Wilkes.**—The State highway commission crushed 6,000 tons of granite for concrete aggregate and roadstone. Zeb Greene (Snipes mine) mined a small quantity of sheet mica.

**Wilson.**—Bryan Rock & Sand Co. (Elm City and Neverson quarries) crushed granite for concrete aggregate, roadstone, and other uses; production increased 10 percent over 1955.

**Yadkin.**—J. E. Dooley (Cycle quarry) crushed granite for concrete aggregate and roadstone; production declined 42 percent.

**Yancey.**—A total of 59 mines produced sheet mica, the 6 leading producers were: Burdette Thomas (Goog Rock mine), Amos Presnell (Moody Rock mine), Gouge & Allen (Barger and Gouge & Allen mines), Cook Mining Co. (Charlie Robinson mine), L. J. Williams (Little Ray mine), Gibbs & Buchanan Mining Co. (Bowditch mine), and J. Mack Thompson (Presnell mine). The leading producers of scrap mica were: Southern Mica Co. of N. C., Inc. (Thompson and Sparks mines), DeWeld Mica Corp. (Crabtree and Hall's Chapel mines), and Hassett Mining Co. (Edge and Simpson mines); production of sheet mica totaled 40,000 pounds and of scrap mica 16,400 tons. Ten DMEA contracts for mica were in force.

McCrary Contracting Service opened a new mine and produced paving gravel. The Feldspar Corp. (Hurst, Mud Hole, Thomas, Towe, and Webb mines), Southeastern Mining & Development Co. (Brushy Fox mine), and Ward Woody (Ward Woody mine) mined crude feldspar; production declined 38 percent.

Digitized by Google

Digitized by Google

# The Mineral Industry of North Dakota

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the State Geological Survey of North Dakota.**

By D. H. Mullen [1]

NORTH DAKOTA in 1956 continued an unbroken upward trend since 1938 in the value of minerals produced and established a new record of 53.6 million—an increase of 21 percent compared with 1955. The greater production and value of petroleum, natural gas, and natural-gas liquids furnished the gain. The value of lignite decreased 9 percent. Mineral fuels as a group supplied 92 percent of the value of mineral production in the State and were 19 percent greater than in 1955.

Exploratory drilling increased to 78 wells completed in 1956 compared with 69 in 1955—a 13-percent gain. Five new fields were discovered, and 3 others were apparent discoveries not completed at the end of the year. Development drilling increased from 181 wells in 1955 to 185 in 1956. Geophysical activity declined from 510 crew weeks in 1955 to 353 in 1956. Additions and expansions were completed at the three refineries, and the first shipment of sulfur from the natural-gasoline plant at Tioga was reported.

**TABLE 1.—Mineral production in North Dakota 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | (2) | (2) | [3] 52,282 | [3] $70,555 |
| Coal (lignite) | 3,102,087 | $7,261,120 | 2,815,174 | 6,578,532 |
| Natural gas, million cubic feet | 5,256 | 405,000 | 11,725 | 950,000 |
| Petroleum (crude), thousand 42-gallon barrels | 11,143 | 32,200,000 | 13,495 | 39,136,000 |
| Pumice | 3,500 | 10,000 | 4,840 | 4,840 |
| Sand and gravel | 11,168,849 | 2,637,988 | 5,946,000 | 4,259,250 |
| Stone | 77,366 | 80,560 | 82,999 | 87,100 |
| Sulfur, long tons | ---------- | ---------- | 1,735 | 45,990 |
| Value of items that cannot be disclosed: Bentonite, natural-gas liquids, and value indicated by footnote 2 | ---------- | 1,528,636 | ---------- | 2,423,200 |
| Total North Dakota | ---------- | 44,123,000 | ---------- | 53,555,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[3] Excludes bentonite; included with "Value of items that cannot be disclosed."

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.

465877—58——55



Digitized by Google

The value of clays produced increased 2 percent, and the value of crushed stone advanced 8 percent. The quantity of sand and gravel decreased sharply from 1955, but the value was increased 61 percent because of a more realistic unit value assigned to production from Government-and-contractor operations.

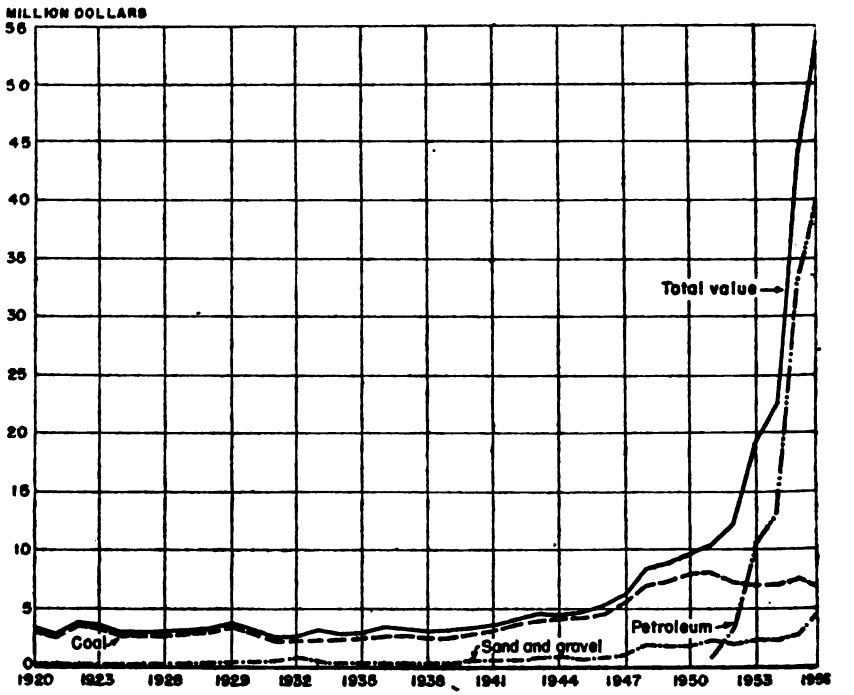



FIGURE 1.—Value of sand and gravel, petroleum, and coal, and total value of mineral production in North Dakota, 1920–56.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Coal (Lignite).**—Coal (lignite) was reported by 44 mines in 16 counties. Production decreased 9 percent compared with 1955. Nearly all of the coal was produced from 39 strip mines in 15 counties. The remainder came from 5 underground mines in 4 counties. The average value of coal in 1956 from strip mines was $2.34 a ton and $3.61 from underground mines. Part of the production was treated for dust control by applying oil. A small tonnage was treated with wax.

Production declined as the result of increased available hydroelectric power from dams on the Missouri River. Generation of power at the Garrison Dam began in February; and, although the pool had not reached the normal operating level at the end of the year, all commitments to firms for power had been met. Power generation at Federal dams on the Missouri River increased 65 percent. The increased power that will be available as Missouri Basin dams are com-

Digitized by Google

TABLE 2.—Production of coal (lignite) in 1955–56, by counties

(Exclusive of mines producing less than 1,000 tons)

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Average value per ton [1] | Short tons | Average value per ton [1] |
| Adams | 41,646 | $3.00 | 38,589 | $2.74 |
| Bowman | 183,750 | 1.70 | 211,948 | 1.85 |
| Burke | 500,078 | 2.33 | 459,507 | 2.31 |
| Burleigh | 17,752 | 3.29 | 18,867 | 3.26 |
| Divide | 287,036 | 2.49 | 286,874 | 2.45 |
| Dunn | 12,657 | 2.88 | 12,609 | 2.83 |
| Grant | 26,565 | 2.83 | 25,049 | 3.04 |
| Hettinger | 13,882 | 2.77 | 11,508 | 2.74 |
| McKenzie | | | 1,625 | 3.94 |
| McLean | 224,697 | 2.67 | 123,772 | 2.90 |
| Mercer | 1,037,372 | 2.24 | 993,690 | 2.25 |
| Morton | 31,937 | 2.53 | 30,934 | 2.47 |
| Oliver | 6,352 | 2.25 | 9,739 | 2.33 |
| Stark | 76,535 | 2.65 | 79,933 | 2.31 |
| Ward | 630,769 | 2.34 | 506,444 | 2.38 |
| Williams | 11,059 | 3.29 | 4,086 | 4.05 |
| Total | 3,102,087 | 2.34 | 2,815,174 | 2.34 |

[1] Value received or charged f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially).

pleted will reduce the demand for coal for thermal-power generation for several years.

The Federal Bureau of Mines continued to investigate gasification of lignite and use of the products of gasification at the Charles R. Robertson Lignite Laboratory at Grand Forks. The results of the experimental work were published.[2]

**Natural Gas.**—Natural gas was marketed from 28 gas wells in the Cedar Creek gas field in Bowman County and from the Tioga oilfield in Williams County after processing in the natural-gasoline plant at the field. Production was marketed through lines of the Montana-Dakota Utilities Co. in North Dakota, Montana, Wyoming, and South Dakota. The quantity marketed in 1956 more than doubled that of 1955. Large quantities of gas from other oilfields was flared or otherwise wasted.

**Natural-Gas Liquids.**—The natural-gasoline plant at the Tioga field in Williams County, active the entire year, recovered natural gasoline, butane, and other natural-gas liquids.

**Petroleum.** Crude-petroleum production increased 21 percent in quantity and 22 percent in value compared with 1955. The increase reflects the active development of new fields and additional refinery capacity at Mandan, Dickinson, and Williston. Standard Oil Co. (Indiana) completed a 6,000-barrel-per-day ultraformer at the plant at Mandan. Queen City Oil & Refining Co. added 3,000 barrels per day of crude capacity to its plant at Dickinson. The company also added 1,200 barrels of vacuum capacity, built a 1,200-barrel-per-day fluid catalytic cracker and a 100-barrel-per-day thermal-polymerization unit. Westland Oil Co. increased the crude-oil capacity of its refinery at Williston by 500 barrels a day, installed a 1,200-barrel

[2] Ongstad, O. C., Chetrick, M. H., and Oppelt, W. H., Cost Data for Gasification of Lignite in an Externally Heated Retort: Bureau of Mines Rept. of Investigations 5272, 1956, 17 pp.

Digitized by Google

**TABLE 3.—Production of crude petroleum, 1955–56, by counties in thousand barrels [1]**

| County | 1955 | 1956 | Producing fields in 1956 |
|---|---|---|---|
| Billings | 231 | 172 | Fryburg. |
| Bottineau | 356 | 392 | Westhope-N, Landa-NE, Souris-N, Kuroki, Newburg, Haas, Unnamed, Westhope. |
| Burke | 110 | 126 | Tioga, Coteau, Columbus. |
| Divide | | 11 | Noonan. |
| McKenzie | 912 | 2,054 | Charlson, Blue Buttes, Sanish-W, Antelope, Croff. |
| Mountrail | 2,323 | 2,514 | Tioga, White Earth, Tioga-E. |
| Renville | 3 | 9 | Bluell. |
| Stark | 5 | 1 | Belfield. |
| Williams | 7,203 | 8,216 | Beaver Lodge, Tioga, Capa, Hofflund, McGregor. |
| Total | 11,143 | 13,495 | |

[1] Based on North Dakota Geological Survey county data adjusted to Bureau of Mines total.

thermal cracking unit, and added 530 barrels of platformer capacity. Throughput of the 3 plants in 1956 was 12.4 million barrels.

Crude-oil production in 1956 came from 26 fields in 9 counties. Four of the producing fields were 1956 discoveries. Major production came from Williams County, followed by Mountrail, McKenzie, and Bottineau Counties, in that order. Divide County became an oil producer in 1956 with discovery of the Noonan field when the No. 1 Braathen was completed on March 12. The most significant discovery in the State was the Antelope field in McKenzie County on May 12 when the No. 1 Lacey-Norby well was completed.

Discoveries of oil in the Madison limestone have become commonplace, but fields with a gross-production section of 300 feet or more are unusual. At the Antelope field the gross-producing section was

**TABLE 4.—Wildcat and development well completions in 1956, by counties**

[Oil and Gas Journal]

| County | Oil | Dry | Total | Footage |
|---|---|---|---|---|
| WILDCAT | | | | |
| Bottineau | 1 | 24 | 25 | 99,200 |
| Burke | 1 | 11 | 12 | 76,700 |
| Cavalier | | 1 | 1 | 2,300 |
| Divide | 1 | 1 | 2 | 14,800 |
| Dunn | | 1 | 1 | 9,200 |
| Eddy | | 3 | 3 | 7,600 |
| Foster | | 7 | 7 | 19,600 |
| McHenry | | 1 | 1 | 4,500 |
| McKenzie | 3 | 5 | 8 | 79,900 |
| McLean | | 1 | 1 | 8,700 |
| Mountrail | | 1 | 1 | 7,700 |
| Renville | | 8 | 8 | 41,900 |
| Ward | | 4 | 4 | 24,100 |
| Wells | | 1 | 1 | 4,400 |
| Williams | 2 | 1 | 3 | 30,800 |
| Total wildcat | 8 | 70 | 78 | 431,400 |
| DEVELOPMENT | | | | |
| Bottineau | 10 | 3 | 13 | 48,400 |
| Burke | | 2 | 2 | 14,200 |
| McKenzie | 68 | 10 | 78 | 743,900 |
| Mountrail | 14 | 2 | 16 | 130,300 |
| Renville | 1 | 2 | 3 | 14,400 |
| Williams | 63 | 10 | 73 | 894,800 |
| Total development | 156 | 29 | 185 | 1,845,700 |
| Total drilling | 164 | 99 | 263 | 1,977,100 |

Digitized by Google

570 feet compared with 350 feet at the Beaver Lodge field—the largest and most productive in the State.

Other discoveries in 1956 were the Kuroki field on June 19 and the Haas field on November 17, both in Bottineau County, and the Columbus field on January 25, in Burke County. Three apparent discoveries were nearing completion at the end of the year: The No. 1 Albert Anderson well in McKenzie County, the No. 1 F. L. Kahlert well in Williams County, and the No. 1 Lucy-Fritz well in Billings County.

Geophysical (seismograph and gravimeter) work declined from 510 crew weeks in 1955 to 353 crew weeks in 1956. Most of the work was seismograph (325 crew weeks) in 17 counties, principally in Bottineau, McHenry, McKenzie, Williams, and Burke Counties. Gravimeter work (28 crew weeks) was done in 5 counties, mostly in Adams and McLean Counties.

## NONMETALS

**Clays.**—Miscellaneous clay was produced in Adams, Divide, and Morton Counties for manufacturing building brick, draintile, other heavy clay products, and lightweight aggregate. A small quantity of bentonite used in foundries was produced in Morton County.

**Pumice.**—Shale, partially fused by the burning of underlying coal beds and locally termed "scoria," was produced in Bowman and Mercer Counties and used for road surfacing.

**Sand and Gravel.**—Reported production of sand and gravel declined 47 percent from the record high of 1955. Reported Government-and-contractor production, especially the State highway department, is based on the quantity of material used on a contract in the year in which the contract is completed, rather than on pit production. Consequently it may vary widely from year to year while the rate of mining remains relatively stable. The production of commercial sand and gravel increased 39 percent; the reported production by Government agencies and contractors decreased 57 percent compared with 1955. Of the 1956 production 80 percent was used for paving and road construction, 14 percent for building, and 6 percent for railroad ballast and other uses. Government-and-contractor operations furnished 84 percent of the sand and gravel used for paving and road construction; almost the entire quantity (82 percent) was produced by or for the State highway department. Because of the realistic price applied to production from Government-and-contractor operations, value of sand and gravel was 61 percent higher than the value of 1955.

Sand and gravel was produced in 28 counties; 21 counties reported commercial production, and 18 counties reported Government-and-contractor production. Leading commercial producers included John Bender in McIntosh County, Bradshaw Gravel Supply in Grand Forks County, Edwin Lindteigen in McLean County, Minot Sand & Gravel Co. in Ward County, and Morrison-Knudsen Co., Inc., in Mountrail County.

**Stone.**—Production of stone in 1956 consisted of crushed granite and crushed miscellaneous stone. The quantity increased 7 percent and the value 8 percent compared with 1955. The entire production

Digitized by Google

**TABLE 5.—Sand and gravel sold or used by producers, 1955–56, by classes of operation and uses**

| Class of operation and use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 201,924 | $201,754 | $1.00 | 301,500 | $291,750 | $0.97 |
| Paving | 127,212 | 37,512 | .29 | 110,000 | 87,750 | .80 |
| Engine | 824 | 830 | 1.01 | | | |
| Total sand | 329,960 | 240,096 | .73 | 411,500 | 379,500 | .92 |
| Gravel: | | | | | | |
| Building | 241,274 | 344,320 | 1.43 | 314,000 | 390,250 | 1.24 |
| Paving | 439,482 | 353,622 | .80 | 623,000 | 429,000 | .69 |
| Railroad ballast | 181,285 | 162,023 | .89 | 303,000 | 269,250 | .89 |
| Other | 45,213 | 21,368 | .47 | 69,500 | 49,000 | .71 |
| Total gravel | 907,254 | 881,333 | .97 | 1,309,500 | 1,137,500 | .87 |
| Total sand and gravel | 1,237,214 | 1,121,429 | .91 | 1,721,000 | 1,517,000 | .88 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 168,750 | 18,750 | .11 | 3,000 | 2,000 | .67 |
| Paving | 1,848,723 | 300,986 | .16 | 1,500,000 | 750,000 | .50 |
| Total sand | 2,017,473 | 319,736 | .16 | 1,503,000 | 752,000 | .50 |
| Gravel: | | | | | | |
| Building | 223,025 | 262,670 | 1.18 | 227,000 | 272,000 | 1.20 |
| Paving | 7,691,137 | 934,153 | .12 | 2,495,000 | 1,718,250 | .69 |
| Total gravel | 7,914,162 | 1,196,823 | .15 | 2,722,000 | 1,990,250 | .73 |
| Total sand and gravel | 9,931,635 | 1,516,559 | .15 | 4,225,000 | 2,742,250 | .65 |
| ALL OPERATIONS | | | | | | |
| Sand | 2,347,433 | 559,832 | .24 | 1,914,500 | 1,131,500 | .59 |
| Gravel | 8,821,416 | 2,078,156 | .24 | 4,031,500 | 3,127,750 | .78 |
| Grand total | 11,168,849 | 2,637,988 | .24 | 5,946,000 | 4,259,250 | .72 |

came from Government-and-contractor operations and was used for riprap and concrete aggregate and roadstone.

**Sulfur.**—Elemental sulfur has been recovered at the natural-gasoline plant at Tioga in Williams County since the plant began operating in 1954. The plant used the Modified Claus process, and recovered sulfur has been stockpiled. In 1956 the first shipment of sulfur was recorded; 1,735 long tons was sold.

**Vermiculite.**—Crude vermiculite from deposits in Montana was exfoliated at a plant at Minot in Ward County. The chief use of the exfoliated product was for insulating houses. A small quantity was used as a lightweight aggregate in concrete and plaster and for miscellaneous applications.

## METALS

**Uranium.**—Exploration of uraniferous lignite deposits continued. The work included drilling, radioactive surveys, and geological investigations. Uranium mineralization was found in sandstones of the Fort Union formation west of the lignite ore area in Golden Valley

Digitized by Google

County. None of these occurrences have been explored sufficiently to determine the extent or grade of the deposits.

Exploration of the uraniferous lignite deposits has outlined several areas where estimated reserves of several hundred thousand tons of material contained 0.15 to 0.30 percent uranium oxide.

The chief obstacle to the development and exploration of the uraniferous lignite deposits continued to be the lack of a suitable process to recover uranium from lignite. The Ohio Oil Co. and the Atomic Energy Commission (AEC) have been active in developing and testing various processes. Dissolving the uranium in acid has not been difficult, however, filtration by normal milling methods was almost impossible. Further work by the AEC was directed toward a process consisting of roasting the material at 1,200° to 1,500° F. to remove interfering tars and oils and leaching the residue with acid to remove the uranium. A pilot plant was erected at Grand Junction, Colo., by the AEC to test the process. The AEC also indicated a contract to purchase uranium concentrate from uraniferous lignite would be considered if a suitable process were perfected and adequate reserves to support the plant were developed.

A small shipment of uraniferous lignite from the E. L. C. and Smith No. 1 leases in Billings County was made to the Mines Development Co. mill at Edgemont, S. Dak., for test purposes.

## REVIEW BY COUNTIES

**Adams.**—The Marion Clay Works produced miscellaneous clay to manufacture building brick and other heavy clay products. Arrowhead Coal Co. produced lignite from a strip pit. Argo Oil Co. completed 10 crew weeks of gravimetric work.

**Barnes.**—Paving gravel was produced by the county highway department. Barnes County led the State in sand and gravel production from Government-and-contractor operations.

**Billings.**—The county ranked fifth in the State in the production of petroleum, which came from the Madison limestone and the Heath sandstone in the Fryburg field. Northern Pump Co. recovered 50 barrels of oil per hour from the Lucy Fritz No. 1 well at 8,043–8,081 feet in the Heath sandstone. The well was bottomed at 9,360 feet in the Madison limestone and was being plugged back to the Heath sandstone at the end of the year. The well was 12 miles south of the Fryburg field—the only producing area in the southwestern part of the State.

A small shipment of uraniferous lignite was made to the Mines Development Co. mill at Edgemont, S. Dak., for test purposes.

**Bottineau.**—Petroleum was produced from 8 fields, 2 of which were discovered in 1956. The county ranked fourth in the State in petroleum production. The principal producing fields were Westhope N, Landa NE, and Souris N. Two new fields were discovered—the Kuroki field in June and the Haas field in November; both produced from the Madison limestone. An apparent discovery, not completed at the end of the year, was the Russell R. Smith well 8 miles south of the Westhope field. Oil and gas was recovered in a drill-stem test at 3,425–3,435 feet from the Spearfish formation.

Digitized by Google

**TABLE 6.—Value of mineral production in North Dakota, 1955–56, by counties[1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adams | $125,738 | $106,567 | Coal, clays. |
| Barnes | 19,900 | 147,000 | Sand and gravel. |
| Benson | 52,598 | 39,500 | Do. |
| Billings | 668,000 | 498,800 | Petroleum. |
| Bottineau | 1,028,000 | 1,136,800 | Do. |
| Bowman | 317,128 | 393,196 | Coal, pumice. |
| Burke | 1,520,337 | 1,477,842 | Coal, petroleum, sand and gravel. |
| Burleigh | 149,396 | 188,557 | Sand and gravel, coal. |
| Cass | 398,322 | ---- | |
| Dickey | 29,383 | 15,000 | Sand and gravel. |
| Divide | 747,401 | 750,893 | Coal, petroleum, clays. |
| Dunn | 36,482 | 35,630 | Coal. |
| Eddy | (2) | 47,250 | Sand and gravel. |
| Foster | 1,522 | 22,000 | Do. |
| Grand Forks | 79,230 | 127,000 | Do. |
| Grant | 75,151 | 76,218 | Coal. |
| Griggs | 1,176 | 13,000 | Sand and gravel. |
| Hettinger | 38,500 | 47,043 | Coal, sand and gravel. |
| McIntosh | 35 | 102,750 | Sand and gravel. |
| McKenzie | 2,674,863 | 6,003,000 | Petroleum, stone, coal. |
| McLean | 732,869 | 536,523 | Coal, sand and gravel. |
| Mercer | 2,332,722 | 2,243,076 | Coal, pumice. |
| Morton | 239,036 | 239,583 | Sand and gravel, coal, clays. |
| Mountrail | 6,831,895 | 7,490,600 | Petroleum, sand and gravel. |
| Nelson | 3,552 | 121,375 | Sand and gravel. |
| Oliver | 14,292 | 22,644 | Coal. |
| Pierce | 17,200 | 19,250 | Sand and gravel. |
| Ransom | 1,494 | 10,000 | Do. |
| Renville | 269,000 | 254,030 | Sand and gravel, petroleum. |
| Richland | 84,617 | ---- | |
| Rolette | 11,641 | 30,500 | Sand and gravel. |
| Sargent | 3,000 | 22,500 | Do. |
| Sheridan | 14,330 | 42,250 | Do. |
| Stark | 280,778 | 258,144 | Coal, sand and gravel, petroleum. |
| Stutsman | 300 | 6,000 | Sand and gravel. |
| Traill | 26,600 | 37,500 | Do. |
| Walsh | 47,343 | 96,250 | Do. |
| Ward | 1,704,800 | 1,567,360 | Coal, sand and gravel. |
| Wells | (2) | 35,000 | Sand and gravel. |
| Williams | 20,925,601 | 24,001,861 | Petroleum, sand and gravel, sulfur, coal. |
| Undistributed[3] | 2,649,072 | 5,292,975 | |
| Total | 44,123,000 | 53,555,000 | |

[1] The following counties are not listed because no production was reported: Cavalier, Emmons, Golden Valley, Kidder, LaMoure, Logan, McHenry, Pembina, Ramsey, Sioux, Slope, Steele, Towner.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes, natural gas-liquids sand and gravel, natural gas, and value indicated by footnote 2.

The county led in the number of wildcat wells completed (25) and in the number of crew weeks (65) of geophysical (seismograph) work completed and ranked fourth in the number of development wells completed (13).

**Bowman.**—The county was fifth in the State in output of lignite, which was produced by the Knife River Coal Mining Co. from the Peerless strip mine. The company also mined shale, partly fused by burning of underlying coal beds and locally termed "scoria", for road construction. Natural gas was produced from 28 wells in the Cedar Creek field by Montana-Dakota Utilities Co.

**Burke.**—Burke County ranked third in the State in lignite production, sixth in petroleum production, and sixth in total value of all minerals. Truax-Traer Coal Co. operated the Kincaid strip mine, and Bonsness Coal Co. produced lignite from a strip pit. Petroleum was produced from that part of the Tioga field lying within the county, Coteau field, and Columbus field—a 1956 discovery. The initial production of the Columbus field was 36 barrels of oil per day from the Madison limestone at a depth of 6,507 feet. An apparent

Digitized by Google

discovery—the Flaxten field—was made when the No. 1 Sorum well pumped 80 barrels of oil a day on December 29 from the Madison limestone at a depth of 6,295 feet. No production was recorded, and the well had not been officially completed at the end of the year. Geophysical (seismograph) exploration was done by 3 companies completing 26 crew weeks of work. Sandberg Construction Co. and Syg Susag produced building sand and gravel and paving gravel. Contractors produced paving gravel for the county highway department.

**Burleigh.**—Ecklund Taplin Coal Co. produced lignite from a strip mine. Dakota Sand & Gravel Co. produced building sand and gravel.

**Divide.**—Divide County was fourth in the State in the production of lignite in 1956 and became a petroleum producer in March when the Braathen No. 1 well was completed in the Madison formation at a depth of 7,076–7,085 feet. Initial production at the new field (Noonan) was 12 barrels of oil per day. At the end of the year total production exceeded 10,000 barrels. Lignite was produced by Baukol-Noonan, Inc., at its strip mine at Noonan. This company also produced miscellaneous clay for manufacturing lightweight aggregate and operated the Noonlite lightweight aggregate plant at Noonan.

**Grand Forks.**—Bradshaw Gravel Supply produced building sand and gravel and building sand. Dakota Reddymix Co. produced building sand and paving gravel for the city of Grand Forks.

**McIntosh.**—Building sand and gravel and paving gravel was produced by John Bender, Ervin Betsch, Otto F. Hinz, and Dave A. Tschetter.

**McKenzie.**—McKenzie County ranked 3d in value of mineral production, 3d in output of petroleum, and 16th in production of lignite and was the only county reporting output of crushed stone. Petroleum came from six fields. Charlson field, with 24 producing wells, ranked 3d in the State, and Blue Buttes with 28 wells was 5th. Antelope field was discovered in May when the Lacey-Norby No. 1 well was completed at 9,118 feet in the Madison limestone. Initial production was 386 barrels of oil per day, and at the end of the year 11 wells had been completed and were producing. The Antelope field was unusual in that the producing section of the Madison limestone has a thickness of 570 feet. The county led in the number of development wells completed (78), of which 68 were successful. Geophysical work (seismograph) was done by 4 companies and 53 crew weeks of work were completed. Nygard Coal Co. produced lignite at the Nygard strip mine at Watford City. The McKenzie County Highway Department produced crushed miscellaneous stone for road construction.

**McLean.**—Lignite was produced from strip mines by Burns & Wretling Coal Co. and Garrison Lignite Co. at Garrison, Turax-Traer Coal Co. from the Custer mine, and Underwood Coal Co. The county ranked sixth in the State in lignite production. Edwin Lindteigen produced paving gravel, and the Minneapolis, St. Paul and Sault Ste. Marie Railroad Co. produced gravel for ballast and fills. Geophysical explorations were made by 2 companies; 10 crew weeks of gravimeter work and 4 crew weeks of seismograph work were completed.

Digitized by Google

**Mercer.**—Mercer County led in lignite production; the entire quantity came from strip mines. Bauer Coal Co. operated the Bauer mine at Beulah. Dakota Collieries Co. operated the Indian Head mine and mined shale, partly fused by the burning of underlying coal beds and locally termed "scoria", for road construction. Knife River Coal Mining Co. operated the Beulah mine and Truax-Traer Coal Co. mined at the Dakota Star. Reinhart Grishkowsky mined lignite.

**Morton.**—Hebron Brick Co. produced miscellaneous clay for manufacturing of building brick, tile, and other heavy clay products. The company also produced a small quantity of bentonite for use in foundries. Molite, Inc., produced miscellaneous clay for manufacturing lightweight aggregate and operated its bloating plant at Mandan. Lignite was produced from strip mines by Flemmer Coal Co., Kaelberer Coal Co., Richter Coal Mine, and the Timpe & Nilles Coal Co. The Harnisch coal mine produced lignite from an underground mine. Helm Bros., Inc., and Riverside Gravel produced building and paving sand and gravel. The county led in sand and gravel production.

**Mountrail.**—Mountrail County ranked second in petroleum production and total value of mineral output and third in sand and gravel production. Petroleum was produced at three fields—Tioga (that part lying in the county), White Earth, and Tioga East fields. Development drilling comprised 16 wells of which 14 were successful. Four crew weeks of geophysical (seismograph) work was completed. Morrison-Knudsen Co., Inc., produced building gravel, railroad ballast, and fill gravel.

**Nelson.**—Clarence Wiseman produced paving gravel for the State highway department, and H. J. Byrnes produced paving gravel for the county highway department.

**Renville.**—Petroleum was produced at the Bluell field. Geophysical exploration (consisting of 5 crew weeks of gravimeter work and 2 crew weeks of seismograph work) was completed. J. L. Shieley Co., Inc., produced building gravel for the United States Corps of Engineers.

**Stark.**—Lignite was produced from strip mines by Dakota Briquets & Tar Products, Inc., Dickinson Coal Mining Co., and Valentine Walter. Petroleum was produced at the Belfield field. Building and paving sand and gravel was produced by Badinger Sand & Gravel pit and Fisher Sand & Gravel Co.

**Ward.**—Ward County led in sand and gravel production, ranked second in lignite output, and was fifth in the total value of minerals. Minot Sand & Gravel Co. produced building and paving sand and gravel and fill gravel. Minneapolis, St. Paul and Sault Ste. Marie Railroad Co. produced gravel for road ballast and for fills. Lignite was produced from strip mines by Quality Lignite Co., Sawyer Fuels, Inc., Truax-Traer Coal Co., and Valley Coal Co. Lignite from an underground mine was produced by the Vix Coal Co. Crude vermiculite from Montana deposits was exfoliated by the Robinson Insulation Co. at its plant at Minot for use mostly in house insulation. A small quantity was used as a lightweight aggregate in plaster and concrete and for soil conditioning.

**Williams.**—Williams County was the major producer of petroleum and led the State in the value of mineral production. Petroleum was produced in five fields—Tioga (that part lying within the county) Beaver Lodge, Capa, Hofflund, and McGregor. Development drilling

Digitized by Google

declined slightly from 1955, with 73 wells completed, of which 63 were successful. Exploratory drilling resulted in one discovery near the Hofflund field, when the No. 1 Kahlert well was completed in the Madison limestone. Initial production was 104 barrels of oil a day from perforations at 8,446–8,466 feet. Total depth of the well was 8,571 feet. Geophysical (seismograph) investigations were made by 3 companies, and 28 crew weeks of work was completed.

Signal Oil & Gas Co. operated its natural-gasoline plant at Tioga using wet gas from the Tioga and Beaver Lodge fields. Natural gasoline, butane, and propane were recovered. Elemental sulfur was recovered by the Modified Claus process. Throughput in 1956 was 11.7 billion cubic feet of wet gas. A part of the dried gas was marketed through pipelines of the Dakota-Montana Utilities Co. Lignite was produced at underground mines by Archie Trowbridge at the Star mine and Ben L. Nelson at the Black Diamond mine.

George Mockel produced building sand and Pioneer Sand & Gravel Co. produced building sand and paving gravel. Bober Construction Co., D. Schubert, and Schultz & Lindsay produced paving gravel for the county highway department.

Digitized by Google

Digitized by Google

# The Mineral Industry of Ohio

By James R. Kerr[1] and Jean A. Pendleton[2]

OHIO'S mineral industries in 1956 produced commodities valued at 10 percent more than in 1955. With few exceptions, increased production was reported for each of Ohio's 15 mineral commodities. Bituminous coal, stone, cement, lime, and sand and gravel, in order of decreasing value of output, were the leading minerals produced during the year. Ohio ranked high nationally in output of minerals, leading in output of grindstones, clay, and lime, and ranked third in output of stone, fourth in sand and gravel, fifth in coal, and fifth in salt. Counties leading in total value of mineral output were Harrison, Belmont, Sandusky, Jefferson, and Greene.

**TABLE 1.—Mineral production in Ohio, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Cement: | | | | |
| Portland.....376-pound barrels | 13,981,909 | $39,642,957 | 15,150,874 | $46,341,562 |
| Masonry.....do | 931,810 | 3,322,967 | 914,371 | 3,451,959 |
| Clays | 6,297,413 | 15,677,389 | 6,702,531 | 17,675,504 |
| Coal | 37,869,791 | 133,814,166 | 38,933,557 | 148,650,186 |
| Lime | 3,038,949 | 39,393,634 | 2,995,320 | 40,804,580 |
| Natural gas.....million cubic feet | 33,756 | 7,595,000 | 25,368 | 6,088,320 |
| Peat | 22,484 | 249,427 | 15,509 | 174,469 |
| Petroleum (crude).....thousand 42-gallon barrels | 4,353 | 12,580,000 | 4,785 | 15,025,000 |
| Salt (common) | 2,905,028 | 14,768,761 | 2,971,702 | 15,922,765 |
| Sand and gravel | 27,906,047 | 31,995,215 | 30,199,822 | 36,146,175 |
| Stone | 33,272,567 | 49,841,246 | [3]33,417,662 | [3] 50,946,715 |
| Value of items that cannot be disclosed: Abrasives stones, gypsum, natural gasoline, natural salines, crushed sandstone (1956), and recovered elemental sulfur | ---- | 2,864,455 | ---- | 5,393,583 |
| Total Ohio [3] | ---- | 340,457,000 | ---- | 375,488,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes certain stone, value for which is included with "Undistributed."
[3] Totals have been adjusted to avoid duplicating value of limestone for cement and lime.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## MINERAL FUELS

**Coal.**—Output of bituminous coal in Ohio in 1956 increased 3 percent compared with 1955. This increase follows a general nationwide trend, but Ohio's increase in coal output did not parallel the rise in neighboring States, falling below increases in production in West Virginia and Pennsylvania. Strip mining made up 62 percent of the total coal output; underground mining, 34 percent; and auger mining, 4 percent. Virtually the entire underground production (over 99 percent) was cut by machine. Ninety percent of output was mechanically loaded by mobile loaders, the chief mechanical loading device; 58 percent went into shuttle cars; 22 percent into mine cars; and 2 percent onto conveyors. Continuous miners did 17 percent of the mechanical loading. The remaining 1 percent was loaded either by self-loading conveyors or handloaded onto conveyors. Of the total coal production, 40 percent was mechanically cleaned, mostly by wet-washing methods. Thirty-one percent was crushed, and 11 percent was treated for dust preventive or antifreezing purposes using either oil or calcium chloride, or a combination of both.

**TABLE 2.—Bituminous coal production, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Value per ton | Year | Short tons | Value | Value per ton |
|---|---|---|---|---|---|---|---|
| 1947–51 (average) | 36, 585, 360 | $140, 011, 516 | $3. 83 | 1954 | 32, 468, 728 | 117, 519, 936 | 3. 62 |
| 1952 | 36, 208, 450 | 138, 090, 700 | 3. 81 | 1955 | 37, 869, 791 | 133, 814, 166 | 3. 53 |
| 1953 | 34, 736, 773 | 131, 475, 408 | 3. 78 | 1956 | 38, 933, 557 | 148, 650, 186 | 3. 82 |

**Coke and Coal Chemicals.**—Ohio led the Nation in number of coke plants (16) but ranked second to Pennsylvania in both number of coke ovens and tons of coke produced. In all 2,493 coke ovens were in existence, as of December 31, 1956, producing 11,799,000 tons of coke valued at $201,232,720 ($17.06 per ton). A total of 51 ovens was abandoned during the year, and on December 31, 1956, 186 ovens were under construction. There were no beehive coke ovens in Ohio in 1956. Coke coproducts recovered at coke plants included 819,222 tons of coke breeze, 170,641,300 thousand cubic feet of coke-oven gas, 256,559,900 pounds of ammonium sulfate and 11,602,400 pounds $NH_3$ content of ammonia liquor, 127,709,300 gallons of coke-oven tar, and 47,779,600 gallons of crude light oil from which 28,035,700 gallons of benzene, 5,075,400 gallons of toluene, 1,805,300 gallons of xylene, and 719,800 gallons of solvent naphtha were derived.

**Peat.**—Production of peat in Ohio dropped for the second successive year to 31 percent below 1955 and 47 percent below 1954. This decrease was opposed to the national trend. The peat was used mostly for soil improvement, chiefly for constructing lawns and improving garden soils. Output was reported by 11 producers in 7 counties in 1956, with production centering in Wyandot County.

Digitized by Google

**Petroleum and Natural Gas.**—A total of 1,086 well completions (including 572 oil, 178 gas, 282 dry holes, and 54 service holes) was made in Ohio in 1956. Average footage was 2,378 feet. Most drilling was in extensions of known fields, although 13 wildcat completions (2 were oil, 5 gas, and 6 dry holes) were reported. Licking County led in total completions, with 145—112 oil, 6 gas, and 27 dry; Coshocton County had 115—82 oil, 10 gas, and 23 dry; and Ashland County had 104—51 oil, 3 gas, and 50 dry holes. Depth classification of wells drilled was as follows: Between 0 and 1,250 feet—254; between 1,250 and 2,500 feet—162; between 2,500 and 3,750—621; between 3,750 and 5,000 feet—46; and between 5,000 and 7,500 feet—3. No wells were drilled deeper than 7,500 feet. The deepest well ever drilled in Ohio was a 7,889-foot dry hole, completed in 1933 to the Clinton sandstone, in Independence Township (Washington County). The deepest producing well was drilled in 1941, a gas well to the Siluvian pay zone 5,899 feet, in Washington Township (Harrison County). Total completions were reportedly held down, owing to a steel shortage.[3]

The record oil-production year in Ohio was 1896, when 13,421,000 barrels was recovered. By comparison, production in 1956 was 4,785,000 barrels.

The oil and gas reserves on January 1, 1957, were given as 56 million barrels of oil and 837 billion cubic feet of gas.[4]

The most notable oil and gas activity in Ohio was leasing of a large block of land in the south-central part of the State for proposed test wells to the Cambrian or Precambrian. Gravimetric anomalies indicate subsurface conditions favorable for oil and gas accumulations.[5]

## NONMETALS

**Abrasive Stones.**—Grindstones were produced by three operators in 1956. Most of the output was quarried in Washington County near Marietta and Constitution, and a smaller quantity was mined at Kipton in Lorain County.

**Cement.**—Shipments of portland cement increased 17 percent in value in 1956. Masonry-cement output dropped 2 percent. Of 11 cement producers in the State, 8 produced both portland and masonry cements, 2 produced portland only, and 1 masonry only. Although most of the cement produced was consumed in Ohio, considerable quantities were shipped to West Virginia, Indiana, and Michigan. Capacity of Ohio cement plants was 17,819,936 barrels, not counting the annual rated capacity of the Consolidation Cement Corp. new plant at Paulding, Ohio, which began operating September 1, 1956, at an annual capacity of 1,250,000 barrels. The company also announced that construction had already begun to increase the annual capacity of this new plant to 2.5 million barrels. The 44 kilns active during the year operated an average of 327 days. Plants were operating at 93-percent capacity during 1956. Although many cement-producing companies reported quarrying raw material from company-owned mines, considerable quantities of the necessary limestone and clay were purchased material.

[3] Oil and Gas Journal, Annual Review and Forecast Number: Vol. 55, No. 4, Jan. 28, 1957.
[4] Committee on Petroleum Reserves, American Petroleum Institute, prelim. rept., 1957, p. 9.
[5] Alkire, Robert L., and Floto, Bernard A., Oil and Gas Developments in Ohio in 1956: Am. Asso. Petrol. Geologists, vol. 41, No. 6, June 1957, pp. 1021–1031.

Digitized by Google

Demand was reported to be fair to good; price increased slightly, and wages rose during the year. Some quarrying operations were adversely affected by weather conditions in late spring.

In addition to the new plant of Consolidation Cement Corp. at Paulding, increased facilities were announced by other producers. Diamond Portland Cement Co. announced plans for a $4 million expansion program to boost annual capacity 1 million barrels. Diamond Alkali Co. announced plans to increase capacity of the Standard Portland Cement Co., (Painesville), Diamond Alkali cement-coke division, by 1 million barrels. Medusa Portland Cement Corp. was also in the midst of a large expansion program. Pittsburgh Plate Glass Co. put a new kiln and finishing mill into operation the last of the year. Addition of increased preparation, calcining, and finishing facilities was announced by other companies during the year.

**TABLE 3.—Finished portland cement produced, shipped, and in stock, 1947–51 (average) and 1952–56**

| Year | Active plants | Production (barrels) | Shipments from mills | | | Stocks at mills on Dec. 31 (barrels) |
|---|---|---|---|---|---|---|
| | | | Barrels | Value | | |
| | | | | Total | Average per barrel | |
| 1947–51 (average) | 9 | 10,442,372 | 10,371,558 | $22,601,803 | $2.18 | 734,844 |
| 1952 | 9 | 11,270,421 | 11,377,806 | 28,488,500 | 2.50 | 748,541 |
| 1953 | 9 | 12,539,132 | 12,532,437 | 32,957,308 | 2.63 | 755,237 |
| 1954 | 9 | 13,306,570 | 13,076,921 | 35,929,163 | 2.75 | 984,704 |
| 1955 | 9 | 13,965,839 | 13,981,909 | 39,642,957 | 2.84 | 838,914 |
| 1956 | 10 | 15,722,402 | 15,150,874 | 46,341,562 | 3.06 | 1,293,165 |

**Clays.**—Ohio continued to lead the Nation in clay production, which increased 6 percent compared with 1955. Production value rose 13 percent, owing chiefly to a 31-percent increase in the value per ton assigned to fire clay used by the producer. The fire-clay industry was the most important in value because it comprised 79 percent of Ohio total-clays value but only 47 percent of the tonnage. Fire-clay output was used principally for manufacturing heavy clay products (61 percent), for fire brick and block (21 percent), and for foundries and steel works (12 percent). Miscellaneous clay was used chiefly for manufacturing heavy clay products (63 percent) and portland and other hydraulic cements (20 percent).

A total of 145 clay mines was active; 119 were open-pit and 26 underground. Leading clay-producing counties was Tuscarawas, Stark, Perry, Columbiana, and Cuyahoga.

Clay-producing companies reported a rise in labor costs during the year and slightly increased prices. The year was marred by labor disputes and strikes in some instances.

Digitized by Google

## TABLE 4.—Clays sold or used by producers, 1955–56, by counties

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Carroll | 200,856 | $480,887 | 209,335 | $512,081 |
| Columbiana | 543,608 | 1,796,316 | 495,388 | 2,767,968 |
| Cuyahoga | 430,541 | 447,541 | 488,424 | 446,453 |
| Darke | 5,000 | 5,000 | (1) | (1) |
| Franklin | 61,038 | 54,698 | (1) | (1) |
| Highland | 17,111 | 34,222 | 16,778 | (1) |
| Hocking | 217,979 | 939,411 | 247,867 | 1,099,037 |
| Holmes | 86,417 | 164,618 | 113,207 | (1) |
| Jackson | 223,512 | 832,226 | 216,646 | 819,621 |
| Jefferson | 202,534 | 830,359 | 183,898 | 1,287,806 |
| Lawrence | 165,880 | 721,121 | 177,027 | 860,345 |
| Madison | 1,112 | 1,112 | (1) | (1) |
| Mahoning | (1) | (1) | 269,983 | (1) |
| Medina | 54,300 | 54,300 | 57,119 | (1) |
| Muskingum | 4,842 | 12,518 | (1) | (1) |
| Noble | 34,599 | 51,898 | 38,873 | (1) |
| Paulding | 19,091 | 40,982 | 22,407 | 41,272 |
| Perry | 389,283 | 599,941 | 528,135 | 684,678 |
| Putnam | 24,578 | 41,556 | 29,196 | 34,247 |
| Scioto | 96,162 | 578,412 | 86,248 | 602,330 |
| Seneca | 8,000 | 8,000 | 5,500 | (1) |
| Stark | 718,032 | 1,900,613 | 780,988 | 1,813,002 |
| Summit | 77,233 | 125,409 | 36,680 | 41,822 |
| Tuscarawas | 1,124,326 | 3,229,184 | 1,284,790 | 3,751,586 |
| Van Wert | 1,890 | 2,340 | (1) | (1) |
| Washington | 60,420 | 49,180 | 41,363 | (1) |
| Wayne | 48,455 | 48,455 | 51,224 | 48,427 |
| Wood | 1,841 | 2,301 | 2,151 | (1) |
| Wyandot | 27,594 | 27,594 | 25,344 | (1) |
| Undistributed [2] | 1,451,179 | 2,597,195 | 1,293,960 | 2,864,829 |
| Total | 6,297,413 | 15,677,389 | 6,702,531 | 17,675,504 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes data for the following counties: Ashland, Belmont, Darke (1956), Delaware, Franklin (1956), Hancock, Harrison, Henry, Licking, Madison (1956), Mahoning (1955), Marion, Muskingum (1956), Portage, Richland, Van Wert (1956), Vinton, and Williams; clays used in cement manufacturing not apportioned by counties; and values indicated by footnote 1.

## TABLE 5.—Clays sold and used by producers in 1956, by kinds and uses, in short tons

| Uses | Fire clay | Miscellaneous clay | Total |
|---|---|---|---|
| Tile, high-grade | 87,399 | 61,986 | 149,385 |
| Architectural terra cotta | 2,282 | | 2,282 |
| Portland and other hydraulic cements | | [1] 1,234,294 | [1] 1,234,294 |
| Refractories: | | | |
| Fire brick and block | 669,283 | | 669,283 |
| Fire-clay mortar | 56,809 | (2) | 56,809 |
| Foundries and steelworks | 386,392 | | 386,392 |
| Kiln furniture, saggers, pins, stilts, and wads | 433 | | 433 |
| Zinc retorts and condensers | 526 | | 526 |
| Chemicals | 5,638 | | 5,638 |
| Heavy clay products | 1,925,499 | 2,241,531 | 4,167,030 |
| Rotary-drilling mud | 2,910 | | 2,910 |
| Lightweight aggregate | | (2) | (2) |
| Undistributed [3] | 27,549 | | 27,549 |
| Total | 3,164,720 | 3,537,811 | 6,702,531 |

[1] Includes fire-clay mortar and lightweight aggregate.
[2] Figure withheld to avoid disclosing individual company confidential data, included with "Portland and other hydraulic cements."
[3] Includes stoneware and art pottery, other refractories, and exports of fire clay.

465877—58——56

Digitized by Google

**Gypsum.**—Output of gypsum in 1956 decreased 21 percent compared with 1955. Production was reported by two companies in Ottawa County. One open-pit and one underground mine were active during the year. Crude gypsum was mined and calcined for use in manufacturing wallboard and lath.

The National Gypsum Co. announced plans for erecting a $6-million wallboard plant at Lorain. The huge plant will employ 300 to 500 men and produce enough gypsum material annually for 50,000 homes.

**Lime.**—Lime production decreased slightly (1 percent) in 1956. Value of production increased 4 percent. The principal factor in the increased total value was the 11-percent rise in output of refractory lime, which had a high unit value; this increased almost $1.00 per ton (6 percent) over 1955. Agricultural lime output decreased during the year. Production of lime for building and chemical and industrial purposes also decreased. Lime for refractory material made up 47 percent of the State total; chemical and industrial lime, 32 percent; building lime, 20 percent; and agricultural lime, 1 percent. The greater part of Ohio production (77 percent) was sold or used as quicklime; the balance was hydrated. Producing companies reported 288 shaft-type and 27 rotary kilns active during the year, using mostly bituminous coal as fuel. The types of hydrators used to produce hydrated lime were as follows: batch—14, continuous—13, atmospheric—5, and pressure—2. Annual lime-burning capacity in Ohio was approximately 3,500,000 tons in 1956.

Basic, Inc., reported two plants idled by strikes from May 15, 1956, to September 18, 1956, during which there was no production. Other producers reported that the July–August steel strike caused a reduction in output.

**TABLE 6.—Lime (quick and hydrated) sold by producers, 1947–51 (average) and 1952–56**

| Year | Agricultural (burnt) | | Building | | Chemical and other industrial | | Refractory | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 48,999 | $530,191 | 558,110 | $7,062,107 | 400,884 | $3,804,993 | 963,032 | $11,562,570 | 1,971,025 | $22,959,861 |
| 1952 | 53,467 | 637,589 | 578,088 | 8,009,903 | 407,007 | 4,139,066 | 1,166,870 | 15,606,702 | 2,205,432 | 28,393,260 |
| 1953 | 52,376 | 618,108 | 556,537 | 8,328,900 | 922,655 | 7,350,473 | 1,414,232 | 19,012,872 | 2,945,800 | 35,310,353 |
| 1954 | 68,460 | 889,070 | 516,679 | 8,133,692 | 1,040,082 | 9,135,604 | 923,825 | 13,285,717 | 2,549,046 | 31,444,083 |
| 1955 | 43,852 | 544,361 | 639,338 | 10,352,762 | 1,086,415 | 9,827,930 | 1,269,344 | 18,668,581 | 3,038,949 | 39,393,634 |
| 1956 | 36,651 | 541,952 | 577,592 | 9,574,331 | 967,767 | 8,612,008 | 1,413,310 | 22,076,289 | 2,995,320 | 40,804,580 |

**Natural Salines.**—The double salt calcium-magnesium chloride was produced in Meigs County by the Pomeroy Salt Corp., the only producer of this commodity in the State. The company operated 200 days, and reported demand was light during the year. Wages increased in 1956.

**Perlite, Expanded.**—Four companies reported production of expanded perlite in Ohio. Crude material was purchased from Western States, principally New Mexico, Colorado, and Nevada. The expanded product was used entirely as a lightweight-aggregate

Digitized by Google

material, mostly in plasters. Companies reported that demand was below normal, as building activity slowed during the year, and a price increase retarded sales temporarily.

**Pigments, Iron Oxide.**—Minnesota Mining & Manufacturing Co. processed pyrite cinders and manufactured red oxides ($Fe_2O_3$) at a plant near Copley in Summit County.

**Salt.**—The value of salt production in Ohio in 1956 increased 8 percent over 1955. The entire salt output came from artificially produced well brines. The greater part of salt produced was consumed in brine form for manufacturing soda ash and chlorine. Evaporated salt had a wide variety of users; some of the more important were feed dealers, meatpackers, tanners, casing manufacturers, grocers, and soap and detergent manufacturers. Demand remained about the same as in 1955, and one operator reported a wage increase. Capacity reported was 595,500 tons of evaporated salt and 2,759,250 tons of salt in brine. The industry operated at 94 percent of capacity during 1956. Salt was produced in 4 counties by 6 producers. Summit and Lake Counties were the leading salt-producing areas.

**TABLE 7.—Salt sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Evaporated | | Brine | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 457,108 | $4,146,321 | 2,253,257 | $1,688,666 | 2,710,365 | $5,834,987 |
| 1952 | 461,289 | 4,189,883 | 2,366,166 | 1,801,743 | 2,827,455 | 5,991,626 |
| 1953 | 498,438 | 5,175,816 | 2,541,799 | 2,308,979 | 3,040,237 | 7,484,795 |
| 1954 | 482,906 | 5,361,838 | 2,266,087 | 6,996,683 | 2,748,993 | 12,358,521 |
| 1955 | 509,905 | 6,113,567 | 2,395,123 | 8,655,194 | 2,905,028 | 14,768,761 |
| 1956 | 514,903 | 7,070,855 | 2,456,799 | 8,851,910 | 2,971,702 | 15,922,765 |

**Sand and Gravel.**—The output of sand and gravel increased 8 percent; the value of production increased 13 percent, reflecting continued activity in the construction industry in Ohio in 1956. Uses for sand and gravel—38 percent for building and 48 percent for paving—indicated the close relationship between the construction

**TABLE 8.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Sand: | | | | |
| Molding | 453,056 | $1,352,772 | (1) | (1) |
| Structural | 5,968,730 | 6,276,596 | 6,182,261 | $6,736,928 |
| Paving | 4,762,545 | 4,553,402 | 4,629,399 | 4,633,557 |
| Filter | 49,804 | 72,757 | 90,430 | 133,422 |
| Railroad ballast | (1) | (1) | 18,360 | 15,606 |
| Other [2] | 777,204 | 2,692,872 | 1,574,986 | 4,625,052 |
| Gravel: | | | | |
| Structural | 5,083,077 | 5,663,175 | 5,413,689 | 6,295,711 |
| Paving | 8,692,037 | 9,319,560 | 9,847,369 | 10,837,270 |
| Railroad ballast | 395,183 | 316,664 | 463,133 | 461,341 |
| Other | 1,724,411 | 1,747,417 | 1,980,195 | 2,407,288 |
| Total sand and gravel | 27,906,047 | 31,955,215 | 30,199,822 | 36,146,175 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes molding sand (1956), glass sand, grinding and polishing sand, blast sand, fire or furnace sand, engine sand, ground sand, railroad ballast (1955) other sands, and data indicated by footnote 1.

Digitized by Google

**TABLE 9.—Commercial sand and gravel sold or used by producers, 1955–56, by counties**

| County | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Number of pits | Short tons | Value | Number of pits | Short tons [1] | Value [1] |
| Adams | 1 | 675 | $270 | | | |
| Allen | | | | 1 | 67,457 | $77,577 |
| Ashland | 3 | 46,117 | 29,470 | 3 | 41,922 | 31,057 |
| Ashtabula | 5 | 154,471 | 162,659 | 5 | 237,668 | 235,846 |
| Athens | 2 | 41,200 | 49,800 | 2 | 57,150 | 73,965 |
| Auglaize | 4 | 292,186 | 333,155 | 3 | 374,034 | 440,277 |
| Butler | 9 | 1,277,606 | 1,297,807 | 8 | 1,655,938 | 1,765,289 |
| Champaign | 2 | 567,076 | 514,967 | 2 | 354,451 | 327,788 |
| Clark | 6 | 339,912 | 325,584 | 7 | 477,697 | 490,919 |
| Clermont | 1 | 492,284 | 539,287 | 1 | 702,441 | 772,685 |
| Clinton | (2) | (2) | (2) | 1 | 108,912 | 64,000 |
| Coshocton | 10 | 287,947 | 246,508 | 10 | 350,310 | 322,322 |
| Crawford | 1 | 34,153 | 29,701 | 1 | 45,313 | 41,715 |
| Cuyahoga | 9 | 958,973 | 1,169,656 | 8 | 823,781 | 814,088 |
| Darke | 6 | 259,568 | 272,280 | 6 | 253,912 | 274,983 |
| Fairfield | 6 | 219,520 | 237,037 | 7 | 170,087 | 189,653 |
| Franklin | 4 | 3,016,434 | 3,415,661 | 5 | 2,675,812 | 3,209,715 |
| Gallia | (2) | (2) | (2) | 3 | 222,487 | 437,696 |
| Geauga | 5 | 629,594 | 784,325 | 7 | 664,246 | 921,630 |
| Greene | 7 | 322,871 | 276,659 | 8 | 364,258 | 303,696 |
| Hamilton | 10 | 3,941,853 | 4,277,076 | 9 | 3,739,375 | 4,429,854 |
| Hancock | 1 | 54,045 | 64,066 | 1 | 76,313 | 76,148 |
| Henry | 2 | 36,902 | 48,561 | 2 | 74,630 | 99,505 |
| Highland | 1 | 9,327 | 5,965 | 1 | 6,482 | 4,036 |
| Hocking | (2) | (2) | (2) | 3 | 72,897 | 105,186 |
| Holmes | (2) | (2) | (2) | 3 | 126,044 | 119,093 |
| Huron | 3 | 114,261 | 115,809 | | (2) | (2) |
| Jackson | | | | 1 | 2,038 | 713 |
| Jefferson | 1 | 43,672 | 57,497 | 3 | 690,007 | 875,645 |
| Knox | 7 | 717,733 | 931,962 | 4 | 596,657 | 656,803 |
| Lake | 9 | 124,086 | 136,932 | 7 | 100,294 | 105,160 |
| Lawrence | (2) | (2) | (2) | 1 | 50,954 | 52,887 |
| Licking | 6 | 342,390 | 341,093 | 8 | 409,154 | 426,614 |
| Logan | 6 | 58,248 | 67,294 | 4 | 41,400 | 46,895 |
| Lucas | 4 | 220,091 | 202,159 | | (2) | (2) |
| Marion | 1 | 41,195 | 45,314 | 1 | 53,382 | 57,720 |
| Mahoning | | | | 2 | 22,553 | 33,884 |
| Medina | 3 | 498,559 | 584,814 | 6 | 898,630 | 989,650 |
| Miami | 7 | 292,267 | 337,514 | 4 | 502,240 | 521,937 |
| Montgomery | 17 | 2,725,779 | 2,370,749 | 15 | 2,733,445 | 2,700,548 |
| Morgan | 2 | 98,428 | 117,300 | 2 | 111,480 | 153,110 |
| Morrow | 1 | 39,000 | 40,785 | 1 | 38,830 | 41,606 |
| Muskingum | 4 | 350,556 | 399,059 | | (2) | (2) |
| Perry | 1 | 18,776 | 59,144 | 1 | 16,019 | 53,775 |
| Pike | 5 | 340,270 | 457,679 | 4 | 427,301 | 614,037 |
| Portage | 15 | 1,492,620 | 2,297,659 | 17 | 1,446,829 | 2,374,862 |
| Preble | 3 | 144,040 | 153,551 | 4 | 176,851 | 199,683 |
| Richland | 4 | 157,188 | 135,117 | 4 | 287,856 | 237,748 |
| Ross | 8 | 603,877 | 585,980 | 6 | 918,056 | 861,960 |
| Sandusky | 1 | 25,222 | 36,572 | 1 | 25,685 | 37,204 |
| Shelby | 4 | 151,865 | 157,434 | 3 | 166,850 | 183,453 |
| Stark | 12 | 1,134,000 | 1,115,659 | 13 | 1,328,794 | 1,349,952 |
| Summit | 15 | 746,900 | 783,112 | 9 | 544,158 | 571,724 |
| Trumbull | 1 | 130,000 | 144,000 | 1 | 183,000 | 207,650 |
| Tuscarawas | 7 | 535,051 | 684,033 | 9 | 652,951 | 840,102 |
| Warren | 7 | 398,992 | 412,509 | 7 | 531,092 | 550,151 |
| Washington | 10 | 327,848 | 445,723 | 6 | 170,254 | 298,448 |
| Wayne | 3 | 17,112 | 14,357 | 4 | 126,104 | 121,007 |
| Williams | 6 | 141,288 | 95,525 | 6 | 199,347 | 125,445 |
| Wyandot | 3 | 93,106 | 91,232 | | (2) | (2) |
| Undistributed [3] | 26 | 2,270,775 | 2,624,714 | 23 | 2,328,377 | 2,878,861 |
| Total | 297 | 27,377,909 | 30,122,775 | 284 | 29,524,205 | 33,797,957 |

[1] Excludes ground sand.
[2] Included with "Undistributed" to avoid disclosing individual company confidential data.
[3] Includes data for Carroll, Columbiana, Erie, Fulton (1956), Hardin (1955), Lorain, Madison, Meigs, Mercer (1955), Pickaway, Union and data indicated by footnote 2.

industry and the sand and gravel industry. The demand for sand and gravel was reported to be good; road building and public works consumed large quantities of this commodity. Private construction created less demand than formerly, as fewer homes were built. Com-

Digitized by Google

petition was keen, and many companies reported profits reduced because of inability to increase prices to cover greater costs and still compete favorably in a highly competitive field. Some dredge operators reported that abnormally high rivers during the spring months cut back production. Plants of the 334 reporting producers were as follows: fixed—188, portable—32, dredges—21, went out of business—26, temporarily abandoned—21, and no report—46.

Hamilton County led in output of sand and gravel, followed by Montgomery, Franklin, Butler, Portage, and Stark.

**Stone.**—Crushed and broken limestone was the leading type of stone produced in Ohio in 1956, comprising more than 90 percent of the stone total. Major uses for the products were as concrete aggregate and roadstone (45 percent), for manufacturing cement and lime (25 percent), as a metallurgical flux (17 percent), for agricultural purposes (6 percent), for railroad ballast (4 percent), for riprap and other uses (4 percent). In all, 56 Ohio counties reported stone production; those leading were Sandusky, Franklin, Ottawa, Seneca, and Wyandot. A small quantity of dimension limestone also was produced.

Both crushed and dimension sandstone was produced in the State; dimension sandstone was the more important industry in value. Sawed and dressed stone comprised the greater part of dimension sandstone. Crushed sandstone used was chiefly for refractory purposes.

Most stone producers reported normal trade and good demand. A few companies reported production above normal, owing to increased roadbuilding. Some reported that the steel strike and adverse weather during the spring slowed production. Competition was keener, and the margin of profit was smaller owing to the increased cost of supplies and maintenance.

National Lime & Stone Co. announced the building of a crushed-limestone plant at Buckland, its ninth plant. The France Stone Co., Toledo, announced plans to reopen a limestone quarry near Middlepoint, which had been inactive since 1944. Dewatering operations began in mid-July.

**TABLE 10.—Stone sold or used by producers, 1955–56, by kinds**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Dimension stone: | | | | |
| Limestone | 7,187 | $14,347 | 13,401 | $33,223 |
| Sandstone | 177,424 | 6,254,099 | 180,779 | 6,991,580 |
| Total dimension stone | 184,611 | 6,268,446 | 194,180 | 7,024,803 |
| Crushed and broken stone: | | | | |
| Limestone | 32,751,130 | 41,717,687 | 33,223,482 | 43,921,912 |
| Sandstone | 336,826 | 1,855,113 | (1) | (1) |
| Total crushed and broken stone | 33,087,956 | 43,572,800 | 33,223,482 | 43,921,912 |
| Grand total | 33,272,567 | 49,841,246 | [2] 33,417,662 | [2] 50,946,715 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Incomplete total, excludes crushed and broken sandstone.

Digitized by Google

**TABLE 11.—Limestone sold or used by producers, 1955–56, by counties**

| County | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Number of pits | Short tons | Value | Number of pits | Short tons | Value |
| Adams | 2 | 461, 305 | $609, 942 | 2 | 381, 477 | $546, 271 |
| Allen | 4 | 741, 931 | 938, 904 | 4 | 912, 265 | 1, 169, 958 |
| Athens | 2 | 91, 039 | 206, 899 | 3 | 144, 588 | 330, 723 |
| Belmont | 2 | 35, 275 | 78, 240 | 2 | 28, 880 | 60, 608 |
| Brown | 2 | 32, 104 | 36, 921 | 2 | 29, 496 | 35, 916 |
| Butler | 1 | 20, 060 | 26, 078 | 1 | 14, 714 | 19, 128 |
| Carroll | | | | 1 | 77, 527 | 138, 725 |
| Clinton | 1 | 385, 923 | 441, 278 | 1 | 365, 587 | 439, 268 |
| Delaware | 4 | 523, 124 | 639, 329 | 4 | 708, 427 | 811, 947 |
| Erie | 3 | 2, 271, 862 | 2, 167, 572 | 3 | 1, 536, 656 | 1, 614, 711 |
| Fairfield | 1 | 11, 707 | 16, 071 | (1) | (1) | (1) |
| Fayette | 3 | 603, 870 | 748, 683 | 3 | 710, 684 | 900, 152 |
| Franklin | 2 | 3, 006, 629 | 3, 463, 343 | (1) | (1) | (1) |
| Guernsey | 1 | 119, 909 | 184, 403 | 1 | 150, 934 | 232, 165 |
| Hamilton | 3 | 22, 486 | 28, 528 | 3 | 33, 012 | 41, 193 |
| Hancock | 3 | 432, 929 | 521, 693 | 3 | 580, 737 | 721, 261 |
| Hardin | 2 | 392, 249 | 495, 188 | 3 | 366, 116 | 467, 776 |
| Harrison | 1 | 181, 097 | 242, 518 | 1 | 222, 652 | 307, 743 |
| Highland | 3 | 360, 331 | 474, 951 | 2 | 371, 702 | 523, 062 |
| Lawrence | 4 | 642, 367 | 784, 640 | 2 | 320, 399 | 451, 659 |
| Logan | 3 | 162. 943 | 188, 703 | 3 | 165, 279 | 201, 723 |
| Lucas | 6 | 2, 214, 600 | 2, 632, 194 | 6 | 1, 754, 178 | 2, 266, 823 |
| Mahoning | 1 | 1, 421, 648 | 2, 803 662 | (1) | (1) | (1) |
| Marion | 3 | 686, 469 | 847, 899 | (1) | (1) | (1) |
| Mercer | 2 | 430, 209 | 530, 479 | 2 | 387, 923 | 482, 828 |
| Miami | 1 | 691, 397 | 1, 373, 059 | 1 | 586, 103 | 1, 195, 070 |
| Monroe | 2 | 23, 808 | 41, 585 | 2 | 28, 374 | 47, 910 |
| Morgan | 1 | 29, 613 | 71, 262 | 1 | 6, 482 | 11, 343 |
| Muskingum | 2 | 804, 535 | 1, 064. 995 | (1) | (1) | (1) |
| Noble | 1 | 73, 000 | 96, 500 | 1 | 18, 000 | 30, 766 |
| Ottawa | (1) | (1) | (1) | 3 | 2, 673, 053 | 3, 008, 347 |
| Putnam | 4 | 280, 687 | 364, 802 | 4 | 302, 342 | 393, 796 |
| Sandusky | 8 | 2, 703, 544 | 3, 563, 460 | 10 | 3, 264, 446 | 4, 249, 982 |
| Seneca | 4 | 2, 107, 282 | 2, 336, 684 | (1) | (1) | (1) |
| Shelby | | | | 1 | 99, 305 | 114, 284 |
| Union | 2 | 303, 342 | 382, 846 | (1) | (1) | (1) |
| Van Wert | 3 | 284, 532 | 334, 493 | 3 | 375, 490 | 436, 914 |
| Vinton | (1) | (1) | (1) | 1 | 29, 762 | 63, 822 |
| Wood | 5 | 645, 855 | 810, 551 | 5 | 632, 807 | 819, 193 |
| Undistributed [2] | 20 | 9, 558, 656 | 12, 183, 679 | 29 | 15, 957, 486 | 21, 820, 068 |
| Total | 112 | 32, 758, 317 | 41, 732, 034 | 107 | 33, 236, 883 | 43, 955, 135 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes data for Auglaize, Clark, Crawford, Greene, Lake (1955), Meigs (1955), Montgomery, Paulding, Preble, Ross (1956), Stark (1955), Summit, and Wyandot and values indicated by footnote 1.

**Sulfur, Recovered Elemental.**—A small quantity of brimstone was recovered by the Republic Steel Corp. at a plant in Cuyahoga County near Cleveland using the Thylox process.

**Vermiculite (Exfoliated).**—Wyodak Chemical Division of the Federal Foundry Supply Co. processed crude vermiculite purchased from Zonolite Co. at Libby, Mont., to exfoliate vermiculite for insulation purposes and for use as a lightweight aggregate material.

## METALS

Although metalliferous ores were not produced in Ohio in 1956, the State continued to lead in processing ores and other raw material into finished metal products.

**Aluminum.**—Olin Revere Metals Corp. was constructing an aluminum plant with a capacity of 180,000 tons of metal a year at Clarington, Ohio. At the beginning of the year Olin Mathieson Chemical Corp. had announced plans to construct a 60,000-ton plant. Later, when this company joined with the Revere Copper and Brass, Inc.,

Digitized by Google

to form the Olin Revere Metals Corp., the plans were revised upward to 180,000 tons.

The raw material, bauxite, will be imported from Surinam, processed to alumina in a company plant to be built at Brunside, La., and shipped up the Mississippi by barge to docks on the Ohio River at the reduction works. Of the metal produced, 120,000 tons will go to Olin and 60,000 tons to Revere. Power will be supplied by two 225,000-kilowatt, coal-fired, generating units owned by Olin Revere at a new plant to be constructed at Cresap, W. Va. A third 225,000-unit will be owned by Ohio Power Co., a subsidiary of American Gas and Electric, which will operate all 3 units. Initial production was expected late in 1957.

**Beryllium.**—Brush Beryllium Co. announced plans to construct a $4.5 million plant between Elmore and Oak Harbor, to handle the increased demand for Reactor-grade beryllium created by a contract awarded to the company by the Atomic Energy Commission (AEC). This company, the only industrial producer of atomic Reactor-grade beryllium, operated the AEC facility at Luckey and a fabrication plant in Cleveland.

**Iron and Steel.**—Ohio ranked second only to Pennsylvania in iron and steel production in 1956. The major Ohio steel producers announced increases in steel-making and auxiliary facilities. United States Steel Corp. announced plans to build a large sintering plant for processing iron ores at its Youngstown works. The plant, which will have a daily capacity of 5,000 tons, should increase blast-furnace capacity because of the use of higher quality iron ore. It is part of a rehabilitation and expansion program at the Ohio works that has been underway since 1946 and on which the company has spent more than $50 million.

Republic Steel Corp. announced plans to increase ingot capacity of its Warren works from 900,000 to 1,308,000 tons with the addition of two new 24-foot electric furnaces, each with capacity of 170 tons per heat.

Detroit Steel Corp. announced plans to expand its Portsmouth works by adding a sintering plant, a 275-ton open-hearth furnace, soaking pits, and other finishing facilities.

Wheeling Steel Corp. has initiated an expansion program at the Mingo Junction and Yorkville plants. Increased capacity, in additional steelmaking facilities in hot-strip mill and finishing and cold-rolling and finishing equipment, was planned.

**Titanium.**—Production of titanium metal in the United States has grown rapidly from 10 tons of sponge metal produced in 1948 to 14,600 tons in 1956. Ohio contained an important segment of the titanium industry, and the State probably will become increasingly important as a producer of sponge metal and mill products if announced expansion plans are carried out.

On September 24, 1956, United States Industrial Chemicals Co., Division of National Distillers Products Corp., announced plans for a 10-million-pound-annual-capacity titanium-sponge plant in Ashtabula near its existing sodium and chlorine plant. Metallic sodium will be used to reduce titanium tetrachloride to titanium sponge instead of magnesium.

Digitized by Google

Electro Metallurgical Co. produced its first sodium-reduced titanium metal at a 7,500-annual-ton plant at Ashtabula, the first United States plant to produce titanium commercially by a method other than the magnesium-reduction process.

Republic Steel Corp. (Cleveland) announced plans for a $8 million expansion of its titanium melting, preparation, forging, and laboratory facilities at its Canton and Massillon plants.

**Zirconium.**—United States Industrial Chemical Co., Division of National Distillers Products Corp., announced plans for constructing a 1.5 million-pound-per-year Reactor-grade, zirconium-sponge plant at Ashtabula and a 500,000-pound-per-year semicommercial metal plant, also at Ashtabula. The smaller plant, which will operate in the interim before construction of the larger one is completed, has been designed for easy conversion to production of titanium or hafnium sponge and also thorium and beryllium.

## REVIEW BY COUNTIES

**Adams.**—Limestone was quarried and crushed at Peebles by the Plum Run Stone Division, New York Coal Co. Output was used mostly for concrete and roadstone; the rest was utilized for coal mine rock dust, agricultural purposes, and railroad ballast.

**Allen.**—The National Lime & Stone Co., Lima, lead in limestone production followed by Western Ohio Stone Co. (Lima), Bluffton Stone Co (Bluffton), and A. J. Suever Stone Co. (Delphos), in order of decreasing value. Four-fifths of the stone was quarried for use as concrete aggregate and roadstone. Railroad ballast and agricultural purposes consumed the remainder of the stone output.

Building and paving sand and gravel and filter sand was produced by C. E. Duff & Son (Westminster).

**Ashland.**—Paving gravel was produced by Bolin & Son (Lucas, the chief producer) and R. C. Meyers. Young Bros. Sand & Gravel Co. (Loudonville) produced a small quantity of sand and gravel for paving purposes. The Ashland County Highway Department reported output of sand for use in road paving.

Miscellaneous clay (shale) was mined by The E. Biglow Co. near New London for use in manufacturing heavy clay products.

**TABLE 12.—Value of mineral production in Ohio, 1955–56, by counties [1 2]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adams | $610,212 | $546,271 | Stone. |
| Allen | 938,904 | 1,247,535 | Stone, sand and gravel. |
| Ashland | (3) | (3) | Sand and gravel, clays. |
| Ashtabula | 162,659 | 235,846 | Sand and gravel. |
| Athens | 2,743,213 | 2,984,795 | Coal, stone, sand and gravel. |
| Auglaize | (3) | (3) | Sand and gravel, stone. |
| Belmont | 27,741,207 | (3) | Coal, stone, clays. |
| Brown | 36,921 | 35,916 | Stone. |
| Butler | 1,323,885 | 1,784,417 | Sand and gravel, stone. |
| Carroll | 2,385,911 | 2,581,803 | Coal, clays, stone, sand and gravel. |
| Champaign | 514,967 | 327,788 | Sand and gravel. |
| Clark | (3) | (3) | Sand and gravel, lime, stone, peat. |
| Clermont | 539,287 | 772,685 | Sand and gravel. |
| Clinton | (3) | 490,998 | Stone, sand and gravel. |
| Columbiana | 7,122,543 | 8,257,777 | Coal, clays, sand and gravel. |
| Coshocton | 3,567,566 | (3) | Coal, sand and gravel, stone. |
| Crawford | (3) | (3) | Stone, sand and gravel. |

See footnotes at end of table.

Digitized by Google

**TABLE 12.—Value of mineral production in Ohio, 1955–56, by counties [1] [2]—Continued**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Cuyahoga | $1,617,698 | $1,260,607 | Sand and gravel, clays, sulfur. |
| Darke | 277,280 | (3) | Sand and gravel, clays. |
| Delaware | 1,136,602 | (3) | Stone, lime, clays, sand and gravel. |
| Erie | (3) | (3) | Cement, stone, sand and gravel. |
| Fairfield | 253,108 | (3) | Sand and gravel, stone. |
| Fayette | 748,683 | 900,825 | Stone, sand and gravel. |
| Franklin | 7,651,944 | 8,020,020 | Stone, sand and gravel, lime, clays. |
| Fulton | ---------- | (3) | Sand and gravel. |
| Gallia | (3) | 3,272,988 | Coal, sand and gravel. |
| Geauga | 784,325 | (3) | Sand and gravel, stone. |
| Greene | (3) | (3) | Cement, sand and gravel. |
| Guernsey | 2,233,150 | 2,237,937 | Coal, stone. |
| Hamilton | 4,305,604 | 4,471,047 | Sand and gravel, stone. |
| Hancock | 687,969 | (3) | Stone, sand and gravel, clays. |
| Hardin | (3) | 467,776 | Stone. |
| Harrison | 34,291,313 | 43,556,460 | Coal, stone, clays. |
| Henry | (3) | (3) | Sand and gravel, clays. |
| Highland | 515,138 | (3) | Stone, clays, sand and gravel. |
| Hocking | 1,383,331 | 1,429,306 | Clay, coal, sand and gravel. |
| Holmes | (3) | 1,628,545 | Stone, clays, sand and gravel, coal. |
| Huron | 115,809 | (3) | Sand and gravel, peat. |
| Jackson | 3,105,480 | 3,366,146 | Coal, clays, sand and gravel. |
| Jefferson | 15,620,435 | 17,796,196 | Do. |
| Knox | 1,252,517 | (3) | Sand and gravel. |
| Lake | (3) | (3) | Cement, salt, sand and gravel. |
| Lawrence | (3) | 9,090,508 | Cement, coal, clays, sand and gravel, stone. |
| Licking | (3) | (3) | Sand and gravel, clays. |
| Logan | 253,397 | 248,618 | Stone, sand and gravel. |
| Lorain | 3,853,420 | (3) | Stone, sand and gravel, grindstone. |
| Lucas | 6,628,095 | (3) | Cement, stone, sand and gravel. |
| Madison | (3) | (3) | Sand and gravel, clays. |
| Mahoning | 6,707,768 | 6,238,277 | Stone, coal, clays, sand and gravel. |
| Marion | 959,033 | (3) | Stone, clays, sand and gravel. |
| Medina | 639,114 | (3) | Sand and gravel, clays. |
| Meigs | 3,143,751 | (3) | Coal, sand and gravel, salt, natural salines. |
| Mercer | (3) | 482,828 | Stone. |
| Miami | 1,710,573 | 1,717,007 | Stone, sand and gravel. |
| Monroe | 41,585 | 48,630 | Do. |
| Montgomery | (3) | (3) | Sand and gravel, stone. |
| Morgan | 4,823,574 | 5,718,571 | Coal, sand and gravel, stone. |
| Morrow | 55,148 | 51,703 | Sand and gravel. |
| Muskingum | (3) | 10,611,218 | Cement, coal, sand and gravel, stone, clays. |
| Noble | 2,910,778 | (3) | Coal, clays, stone. |
| Ottawa | (3) | 9,831,127 | Lime, stone, gypsum. |
| Paulding | (3) | (3) | Cement, stone, clays. |
| Perry | 8,845,195 | (3) | Coal, sand and gravel, clays. |
| Pickaway | (3) | (3) | Sand and gravel. |
| Pike | 460,479 | (3) | Stone, sand and gravel. |
| Portage | 3,825,964 | 4,658,442 | Sand and gravel, stone, coal, clays, peat. |
| Preble | (3) | (3) | Lime, sand and gravel, stone. |
| Putnam | 406,358 | 428,043 | Stone, clays. |
| Richland | 302,536 | (3) | Sand and gravel, clays, peat. |
| Ross | 585,980 | (3) | Sand and gravel, stone. |
| Sandusky | 16,840,954 | 17,847,616 | Lime, stone, sand and gravel. |
| Scioto | 2,470,215 | 2,729,187 | Stone, clays. |
| Seneca | (3) | (3) | Lime, stone, clays. |
| Shelby | 157,434 | 297,737 | Sand and gravel, stone. |
| Stark | 10,101,133 | 10,917,622 | Cement, coal, clays, sand and gravel, peat. |
| Summit | (3) | 12,688,748 | Salt, lime, sand and gravel, stone, clays, peat. |
| Trumbull | 144,000 | 207,650 | Sand and gravel. |
| Tuscarawas | 11,872,661 | 12,644,970 | Coal, clays, sand and gravel. |
| Union | (3) | (3) | Stone, sand and gravel. |
| Van Wert | 336,833 | (3) | Stone, clays. |
| Vinton | (3) | (3) | Coal, clays, stone. |
| Warren | 412,509 | 550,151 | Sand and gravel. |
| Washington | 1,044,635 | 1,139,093 | Coal, sand and gravel, grindstone, clays. |
| Wayne | (3) | (3) | Salt, coal, sand and gravel, clays. |
| Williams | (3) | (3) | Sand and gravel, clays. |
| Wood | 1,665,448 | 1,449,603 | Stone, lime, clays. |
| Wyandot | (3) | (3) | Stone, lime, sand and gravel, peat, clays. |
| Undistributed | 125,601,088 | 158,216,973 | |
| Total | 340,457,000 | 375,488,000 | |

[1] Defiance County was not listed as no production was reported.
[2] Fuels, including natural gas, petroleum, and natural gas liquids, not listed by counties as data are not available, included with "Undistributed."
[3] Figure withheld to avoid disclosing individual company confidential data. Value included with "Undistributed."

Digitized by Google

**Ashtabula.**—The Gleason Sand & Gravel, Inc. (formerly known as A. C. Meade Construction Co., Inc.) (Conneaut), and Northeast Materials, Inc. (Kingsville) were the leading sand and gravel producers. Other outstanding producers were Peerless Mineral Products Co., Conneaut, and Carter Sand & Gravel Co., Ashtabula. Building and paving claimed most of the output, and a small part was used as molding sand and railroad ballast. Pinney Dock & Transport Co., Kingsville, reported output of gravel for use as fill and for road paving.

**Athens.**—Of the 32 active coal mines, 23 underground operations supplied three-fourths of total output. Gem Coal Co. was by far the leading producer. Considerable tonnage was also mined from the strip pits of the Furr Coal Co. and the Carbondale Coal Co.

Limestone for concrete and roadstone was obtained from the quarries of Dickson Bros. and Diamond Stone Quarries, Inc., both of Albany; and Amesville Stone Co., Amesville.

The Athens Building Material Co. (Athens) was the leading producer of sand and gravel for building and paving. John Slater (The Plains) reported sand and gravel for building purposes, and the State highway department reported sand and gravel produced under contract for road maintenance.

**Auglaize.**—The value of sand and gravel increased one-third over the previous year. Wapak Sand & Gravel Co. (Wapakoneta) was the outstanding producer of building and paving sand and gravel. Quality Sand & Gravel Co. and Western Ohio Stone Co. (both near Wapakoneta) produced building sand and gravel and paving sand and gravel, respectively.

Limestone crushed for use as concrete aggregate and for agricultural purposes was quarried at the Buckland quarry of National Lime & Stone Co. near Wapakoneta.

**Belmont.**—Out of 25 coal-producing counties, Belmont ranked second in both tonnage (over 7 million tons) and number of active mines (52). The foremost underground producer was Powhatan Mining Co. followed in order of decreasing tonnage by The Youghiogheny & Ohio Coal Co., The Saginaw Dock & Terminal Co., The David Z. Norton Co., and the Lorain Coal & Dock Co. These companies supplied over three-fourths of the county output.

Limestone was crushed by W. J. Plumly at Somerton Crushing quarry, Somerton; and George & C. H. McCort, Malaga.

Belmont Brick Co. (Bellaire) mined miscellaneous clay for heavy clay products.

**Brown.**—Limestone was quarried by the Brown County Highway Department and by Howard S. Watson (Georgetown) for use as concrete aggregate and for agricultural purposes.

**Butler.**—Butler was an important area in output of sand and gravel, as the county ranked fifth in the State in value of sand and gravel production. The two plants of American Materials Corp. near Hamilton yielded the greater part of output. Other producers were Middletown Sand & Gravel Co. and Moorman Sand & Gravel Corp., both of Middletown; Hamilton Gravel Co., North Cincinnati Sand & Gravel Co., Sipp Sand Co., and W. J. Cisle & Son, all of Hamilton; and Central Gravel & Ready Mix Co., Oxford. Sixty-five percent of the production was used for paving and 30 percent for building purposes; the remainder was employed for railroad ballast and miscella-

Digitized by Google

neous uses. The North Cincinnati Co. also quarried limestone for use as concrete aggregate and roadstone.

**Carroll.**—The most important mineral mined in the county was coal. The greater part of coal output was obtained from strip mines. Leading producers were the James Bros. Coal Co., Clarence Mining, Inc., and Billman Coal Co.

Fire clay was mined by the Metropolitan Brick, Inc., Minerva; and Whitacre-Greer Fireproofing Co. and the Natco Corp., both of Magnolia. The Robinson Clay Products Co. (Malvern) reported miscellaneous clay, and the Natco Corp. also mined miscellaneous clay. Output was used for heavy clay products.

Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co. (Carrollton), quarried limestone for concrete aggregate. The Rainbow Stone Co. (Sherrodsville) produced dimension sandstone for architectural purposes.

Molding sand was produced by the Mineral City Sand Co. at Mineral City.

**Champaign.**—The American Aggregates Corp. (Urbana) produced large quantities of sand and gravel for road paving and railroad ballast. Walter R. Dorsey produced paving gravel at a plant near Cable.

**Clark.**—The value of sand and gravel rose over 50 percent in 1956 as compared with 1955. Springfield Cement Products, Inc. (Springfield), and Enon Sand & Gravel Co. (Enon) were the principal companies. Other producers were Springfield Gravel & Excavating Co., Springfield; Porter Bros. Washed Sand & Gravel Co., New Carlisle; and Kiefer Sand & Gravel Co., Yellow Springs. M. L. Eidemiller (Springfield) and W. M. & Lee Upton for New Carlisle Sand & Gravel (New Carlisle) mined gravel. County output was used mostly for building and paving purposes.

The Moores Lime Co. quarried and crushed limestone for use as concrete aggregate, blast-furnace flux, agricultural purposes, and for use in manufacturing lime at its Durbin plant. The product was used for water softening, sewage treatment, paper bleach and petroleum refining.

Humus peat was produced by Harold A. Skinner (New Carlisle).

**Clermont.**—Large quantities of sand and gravel were produced by the Ohio Gravel Co. at Miamiville. Output was used for building (36 percent), paving (27 percent) and railroad ballast (5 percent). Crushed boulders furnished the remainder of production (32 percent).

**Clinton.**—The Melvin Stone Co. (Melvin) quarried limestone for concrete aggregate, agricultural purposes, blast-furnace flux, riprap, and for use as refractory dolomite. Sand and gravel was also produced by the company at a plant near Wilmington for building and paving purposes.

**Columbiana.**—Coal mined in Columbiana County came principally from strip pits. The leading producers were Buckeye Coal Mining Co., Inc., Ferris Coal Co., A. B. C. Mining Co., Inc., and Industrial Mining & Engineering Co.

Of the 41 clay-producing counties in the State, Columbiana ranked second in value of production. Fire clay for use in fire brick and block, mortar, foundries and steelworks, heavy clay products, and stoneware was mined by McLain Fire Brick Co., Division of H. K. Porter Co., Inc., the leading producer, at an underground mine near

Digitized by Google

Hammondsville and two underground mines near Wellsville. Metropolitan Brick, Inc., and Natco Corp. (both of Negley) were the other fire-clay producers. Miscellaneous clay for heavy clay products and floor and wall tile was mined from the open pits of Summitville Face Brick Co., Summitville; American Vitrified Products Co., East Liverpool and Lisbon; and L. L. Adams Clay Co., Lisbon.

Iron City Sand & Gravel Corp. dredged large quantities of sand and gravel from the Ohio River for use in building and paving. Molding sand was produced by The Morgan Sand Bank Co. at a fixed plant near Leetonia.

**Coshocton.**—The leading producers of strip-mined coal were Mt. Perry Coal Co., Freeport Gas Coal Co., Blue Crystal Mines, Inc., Fresno Coal Co., Adam Mills Coal Co., and Hutt Coal Co.

Ten commercial sand and gravel operations yielded output for building and paving. The two plants of W. P. McCarren Co. (near Walhonding and Canal Lewisville) and the plant of B. W. Boyd & Son (Coshocton) furnished the greater part of county output.

The Pearl Sandstone Co. (Fresno) produced dimension sandstone for architectural purposes and flagging.

**Crawford.**—The National Lime & Stone Co. (Bucyrus) quarried a large quantity of limestone for concrete aggregate, agricultural purposes, and railroad ballast. The Crawford County Highway Department was the other producer of limestone in the county.

Sand and gravel output was reported by the Galion Gravel Co. (Galion) for building and paving. The company also reported filter sand production.

**Cuyahoga.**—The leading producer of sand and gravel was Newburg Sand & Gravel Co. (Garfield Heights). Considerable quantities were also produced by Charles Loparo Sand & Gravel Co., Canal Sand & Gravel Co., both of Cleveland; Testa Bros., Inc., Glenwillow; The Schmidt Bros. Sand & Supply Co., Garfield Heights; and Shaker Sand & Gravel Co., Cleveland.

Miscellaneous clay was mined from six open pits and was used for heavy clay products and lightweight aggregates. Production in order of decreasing value, came from the following companies: Hydraulic Press Brick Co., South Park; Cleveland Builders Supply Co. Warner plant at Garfield Heights and Pearl Plant at Cleveleand; The Collinwood Shale Brick & Supply Co., Cleveland; The Ohio Clay Co., Garfield Heights; and The Berea Brick & Tile Co., Berea.

Sulfur was recovered in the liquid purification of gas by Republic Steel Corp. at its plant near Cleveland. Expanded perlite was also processed near Cleveland by Cleveland Builders Supply Co. The Wyodak Chemical Division, Federal Foundry Supply Co., exfoliated vermiculite at Cleveland from crude material mined at Libby, Mont.

**Darke.**—The American Aggregates Corp. (Fort Jefferson) was the leading producer of sand and gravel. Output was reported by five additional small producers. The county output was virtually all utilized for paving with the exception of a small quantity used for building.

Miscellaneous clay for heavy clay products was mined by Darke County Tile Co. (Greenville).

**Delaware.**—The Scioto Lime & Stone Co. quarried limestone near Delaware. A large part of output was used as concrete aggregate,

Digitized by Google

railroad ballast, agricultural puposes, and riprap. The remainder of production was used in manufacturing lime at its plant. This lime was used for metallurgical purposes, in the purification of water, in sewage and trade-waste treatment, for chemical purposes, and as a paper bleach. Sizable quantities of limestone were also reported by Penry Stone Co., Radnor; Owens Stone Co., Ostrander; and Shawnee Stone Co., Inc., Powell.

The Delaware Clay Co. (Westerville) and Galena Shale Tile & Brick Co. (Galena) mined miscellaneous clay for heavy clay products.

Paving gravel was produced by the Ohio State Highway Department.

**Erie.**—The Medusa Portland Cement Co. quarried limestone for manufacturing cement at Baybridge. The Wagner Quarries Co. (Sandusky) and Castalia Quarries Co. (Castalia) quarried limestone for use as concrete aggregate, railroad ballast, agricultural purposes, and riprap.

Keener Sand & Clay Co. produced molding sand at a fixed plant near Huron.

**Fairfield.**—The plant of F. H. Brewer Co. near Lancaster was the principal producer of sand and gravel in the county. Sargent Gravel Co. and Homer Taylor & Son (Lancaster) and Industrial Minerals Co. (Bremen), reported output of considerable tonnages.

Limestone was quarried for concrete aggregate and agricultural purposes by the Rushcreek Limestone Co. at Lancaster.

**Fayette.**—Crushed limestone was produced by Blue Rock, Inc., Fayette Limestone Co., Inc., and Sugar Creek Stone Co., all of Washington. Of the total production, 74 percent was utilized as concrete aggregate; the remainder was used in riprap, agricultural purposes, and railroad ballast.

A small quantity of paving gravel was produced under contract by the Ohio State Highway Department.

**Franklin.**—Franklin County ranked second in the State in the value of stone and sand and gravel production. The Marble Cliff Quarries Co. (Columbus) crushed limestone for flux in blast furnaces, concrete aggregate, railroad ballast, agricultural purposes, and use in open-hearth plants. Part of the output was also used by the company in manufacturing quick and hydrated lime.

The American Aggregates Corp. (Columbus) was by far the leading producer of sand and gravel. Other producers were Jackson Pike Sand & Gravel Co., Mason's Sand & Gravel Co. and Arrow Sand & Gravel Co., subsidiary of Marble Cliff Quarries, all of Columbus. Output was used for building, paving, and railroad ballast. The Illinois Silica Sand Co. (Columbus) produced molding sand.

Miscellaneous clay for heavy clay products was mined from open pits near Blacklick by Columbus Clay Manufacturing Co. and the Claycraft Co.

**Fulton.**—The Stoop Gravel Co. produced a small quantity of paving gravel.

**Gallia.**—Coal was mined mostly from strip and auger mines; leading were those of the Ohio River Collieries Co., Gallia Coal Co., and Middleport Coal Co. Of the several small underground producers, Fitch Coal Co. was outstanding.

Digitized by Google

**Ashtabula.**—The Gleason Sand & Gravel, Inc. (formerly known as A. C. Meade Construction Co., Inc.) (Conneaut), and Northeast Materials, Inc. (Kingsville) were the leading sand and gravel producers. Other outstanding producers were Peerless Mineral Products Co., Conneaut, and Carter Sand & Gravel Co., Ashtabula. Building and paving claimed most of the output, and a small part was used as molding sand and railroad ballast. Pinney Dock & Transport Co., Kingsville, reported output of gravel for use as fill and for road paving.

**Athens.**—Of the 32 active coal mines, 23 underground operations supplied three-fourths of total output. Gem Coal Co. was by far the leading producer. Considerable tonnage was also mined from the strip pits of the Furr Coal Co. and the Carbondale Coal Co.

Limestone for concrete and roadstone was obtained from the quarries of Dickson Bros. and Diamond Stone Quarries, Inc., both of Albany; and Amesville Stone Co., Amesville.

The Athens Building Material Co. (Athens) was the leading producer of sand and gravel for building and paving. John Slater (The Plains) reported sand and gravel for building purposes, and the State highway department reported sand and gravel produced under contract for road maintenance.

**Auglaize.**—The value of sand and gravel increased one-third over the previous year. Wapak Sand & Gravel Co. (Wapakoneta) was the outstanding producer of building and paving sand and gravel. Quality Sand & Gravel Co. and Western Ohio Stone Co. (both near Wapakoneta) produced building sand and gravel and paving sand and gravel, respectively.

Limestone crushed for use as concrete aggregate and for agricultural purposes was quarried at the Buckland quarry of National Lime & Stone Co. near Wapakoneta.

**Belmont.**—Out of 25 coal-producing counties, Belmont ranked second in both tonnage (over 7 million tons) and number of active mines (52). The foremost underground producer was Powhatan Mining Co. followed in order of decreasing tonnage by The Youghiogheny & Ohio Coal Co., The Saginaw Dock & Terminal Co., The David Z. Norton Co., and the Lorain Coal & Dock Co. These companies supplied over three-fourths of the county output.

Limestone was crushed by W. J. Plumly at Somerton Crushing quarry, Somerton; and George & C. H. McCort, Malaga.

Belmont Brick Co. (Bellaire) mined miscellaneous clay for heavy clay products.

**Brown.**—Limestone was quarried by the Brown County Highway Department and by Howard S. Watson (Georgetown) for use as concrete aggregate and for agricultural purposes.

**Butler.**—Butler was an important area in output of sand and gravel, as the county ranked fifth in the State in value of sand and gravel production. The two plants of American Materials Corp. near Hamilton yielded the greater part of output. Other producers were Middletown Sand & Gravel Co. and Moorman Sand & Gravel Corp., both of Middletown; Hamilton Gravel Co., North Cincinnati Sand & Gravel Co., Sipp Sand Co., and W. J. Cisle & Son, all of Hamilton; and Central Gravel & Ready Mix Co., Oxford. Sixty-five percent of the production was used for paving and 30 percent for building purposes; the remainder was employed for railroad ballast and miscella-

Digitized by Google

neous uses. The North Cincinnati Co. also quarried limestone for use as concrete aggregate and roadstone.

**Carroll.**—The most important mineral mined in the county was coal. The greater part of coal output was obtained from strip mines. Leading producers were the James Bros. Coal Co., Clarence Mining, Inc., and Billman Coal Co.

Fire clay was mined by the Metropolitan Brick, Inc., Minerva; and Whitacre-Greer Fireproofing Co. and the Natco Corp., both of Magnolia. The Robinson Clay Products Co. (Malvern) reported miscellaneous clay, and the Natco Corp. also mined miscellaneous clay. Output was used for heavy clay products.

Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co. (Carrollton), quarried limestone for concrete aggregate. The Rainbow Stone Co. (Sherrodsville) produced dimension sandstone for architectural purposes.

Molding sand was produced by the Mineral City Sand Co. at Mineral City.

**Champaign.**—The American Aggregates Corp. (Urbana) produced large quantities of sand and gravel for road paving and railroad ballast. Walter R. Dorsey produced paving gravel at a plant near Cable.

**Clark.**—The value of sand and gravel rose over 50 percent in 1956 as compared with 1955. Springfield Cement Products, Inc. (Springfield), and Enon Sand & Gravel Co. (Enon) were the principal companies. Other producers were Springfield Gravel & Excavating Co., Springfield; Porter Bros. Washed Sand & Gravel Co., New Carlisle; and Kiefer Sand & Gravel Co., Yellow Springs. M. L. Eidemiller (Springfield) and W. M. & Lee Upton for New Carlisle Sand & Gravel (New Carlisle) mined gravel. County output was used mostly for building and paving purposes.

The Moores Lime Co. quarried and crushed limestone for use as concrete aggregate, blast-furnace flux, agricultural purposes, and for use in manufacturing lime at its Durbin plant. The product was used for water softening, sewage treatment, paper bleach and petroleum refining.

Humus peat was produced by Harold A. Skinner (New Carlisle).

**Clermont.**—Large quantities of sand and gravel were produced by the Ohio Gravel Co. at Miamiville. Output was used for building (36 percent), paving (27 percent) and railroad ballast (5 percent). Crushed boulders furnished the remainder of production (32 percent).

**Clinton.**—The Melvin Stone Co. (Melvin) quarried limestone for concrete aggregate, agricultural purposes, blast-furnace flux, riprap, and for use as refractory dolomite. Sand and gravel was also produced by the company at a plant near Wilmington for building and paving purposes.

**Columbiana.**—Coal mined in Columbiana County came principally from strip pits. The leading producers were Buckeye Coal Mining Co., Inc., Ferris Coal Co., A. B. C. Mining Co., Inc., and Industrial Mining & Engineering Co.

Of the 41 clay-producing counties in the State, Columbiana ranked second in value of production. Fire clay for use in fire brick and block, mortar, foundries and steelworks, heavy clay products, and stoneware was mined by McLain Fire Brick Co., Division of H. K. Porter Co., Inc., the leading producer, at an underground mine near

Digitized by Google

M. T. Epling Co. (Gallipolis) and Richards & Son (Cheshire) reported sand and gravel output for building, paving, and railroad ballast. Keener Sand & Clay Co. (Gallia) produced molding sand. M. T. Epling also produced a small quantity of blast sand. Paving gravel output was reported by the Gallia County Highway Department.

**Geauga.**—Molding sand, fire or furnace sand, and paving sand and gravel were reported by R. W. Sidley, Thompson, the leading producer in the county. Other companies were Jefferson Materials Co., Burton; General Refractories Co., Warren; and Sperry Road Sand & Gravel Co., Chardon, all for building and paving purposes.

Quartzite for silica brick was quarried near Thompson by Harbison-Walker Refractories.

**Greene.**—Greene County was the leading area in cement manufacture owing to the output of Southwestern Portland Cement Co. and Universal Atlas Cement Co. (both of Fairborn). Its limestone plants were also at Fairborn, where the stone was quarried and crushed for use in manufacturing cement.

Sand and gravel was produced by Charles F. McNamee, Fairborn; and K. E. Macy for Greene Township Gravel Co., Cedarville. Gravel output was reported by six operators; the leading producer was Phillips Sand & Gravel Co. (Xenia). Building and paving uses consumed the county sand and gravel output.

**Guernsey.**—The coal mined in Guernsey County came mostly from the strip and auger mines of Virginia Mining Co. The remainder of production came from 10 smaller mines; the largest were the strip pit of C. V. & W. Coal Co., Inc., and the underground mine of Byesville Coal Co.

John Gress (New Concord) quarried limestone for concrete and roadstone.

**Hamilton.**—Hamilton County led in the value of sand and gravel, owing to the large quantities produced at the four operations of the Ohio Gravel Co. at Newtown, Miamitown, Cleves, and Camp Dennison. The remainder of county output was produced, in order of decreasing value, by the Willey-Ruckstuhl Co., Miamitown; H. Lynne Barber, Cincinnati; George L. Rack, Inc., Cincinnati; Skinner Sand & Gravel Co., Reading; and Terrace Park Gravel Co., Terrace Park. Output was used almost exclusively for building and paving, except a small quantity that was utilized for railroad ballast and miscellaneous purposes.

The Ohio Gravel Co. operated two plants near Newton and Camp Dennison and quarried and crushed limestone for agricultural purposes. The City of Cincinnati, Highway Maintenance Division, produced a small quantity of limestone for use as concrete aggregate.

The Indoken Perlite Co. continued to expand perlite near Cincinnati.

**Hancock.**—Limestone for concrete aggregate, railroad ballast, and agricultural purposes was quarried by the National Lime & Stone Co. and the Tarbox-McCall Stone Co. both of Findlay; and the Pifer Stone Co., Inc., Williamstown.

Hobbs Bros. Sand & Gravel Co. (McComb) produced sand and gravel, principally for building and paving and gravel for filter beds.

Digitized by Google

The Hancock Brick & Tile Co (Findlay) mined miscellaneous clay for heavy clay products.

**Hardin.**—Limestone was quarried by the Herzog Lime & Stone Co. (Forest), the leading producer; Hardin Quarry Co., Blanchard; and the France Co., Kenton. The product was used for concrete aggregate, metallurgical work, agricultural purposes, railroad ballast, and riprap.

The Bell Sand & Gravel Co. reported operations permanently abandoned.

**Harrison.**—Harrison County led in coal production, as mining flourished in 1956 with output over 10 million tons, a 17-percent increase from 1955. Sixty-seven percent of the coal was mined from strip pits, 30 percent from underground mines, and 3 percent by auger methods. Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co., was by far the greatest producer, operating three mines—strip, underground, and auger. The underground mine of the Youghiogheny & Ohio Coal Co. was also a principal source of coal followed by the strip operations of Cadiz Mining Co., R. & F. Coal Co., Powhatan Mining Co., Cravat Coal Co., and Bedway Coal Co.

The Hanna Coal Co. also quarried large quantities of limestone near Cadiz for concrete aggregate and agricultural purposes.

The Bowerston Shale Co. mined miscellaneous clay from an open pit near Bowerston for heavy clay products.

**Henry.**—Sand for building purposes was dredged from the Auglaize River by Arthur A. Williams (McClure) and Leo Eberwine for Napoleon Sand & Gravel Co. (Napoleon). A small quantity of paving gravel was produced by the Henry County Highway Department.

August Honeck & Son (Malinta) and Napoleon Brick & Tile Works (Napoleon) mined miscellaneous clay for heavy clay products.

**Highland.**—Limestone was quarried and crushed for use as concrete aggregate and for agricultural purposes by Highland Stone Division New York Coal Co., Hillsboro; and Ohio Asphaltic Limestone Co., near Vienna.

Miscellaneous clay for heavy clay products was mined by the Mowrystown Brick & Tile Co. (Mowrystown).

A small quantity of gravel for use as fill was produced by Uhrig & Collins (Hillsboro).

**Hocking.**—Hocking County was an important area for fire-clay mining. The Natco Corp. Haydenville and Diamond plants (near Haydenville and Nelsonville, respectively) and General Hocking Brick Co. (Logan) reported output for heavy clay products. Miscellaneous clay was also mined by the General Hocking Brick Co.

Fifteen small coal mines were active during the year; the largest were the strip operations of Wharton Coal Co., Inc., and Red Arrow Coal Co.

Sand and gravel for building and paving was produced by the F. H. Brewer Co., Enterprise; and Hocking Valley Sand & Gravel Co., Logan. Central States Co. (Chillicothe) and the Ohio State Highway Department reported output of gravel for paving roads.

Digitized by Google

**Holmes.**—Dimension sandstone was quarried for architectural use and flagging by the Briar Hill Stone Co., Glenmont; and The Nicholl Stone Co., Killbuck.

Fire clay and miscellaneous clay were mined by the General Clay Products Co. (Baltic) for heavy clay products. The Holmes Limestone Co., Holmes Clay Division (Berlin) mined fire clay principally for heavy clay products and also for use in foundries and steelworks, for manufacturing fire brick and block, and for rotary-drilling mud.

The sand and gravel output of Feikert Sand & Gravel Co. (Millersburg) was used almost entirely for paving except for a small quantity, which was used for fill. Gravel was produced by Close Sand & Gravel Co. (Millersburg) and F. E. Kaser (Holmesville) for building and paving.

The county output of coal, was mined underground by Union Coal Co. and strip-mined by Kuhn & Smith, Inc., and The Holmes Limestone Co.

**Huron.**—The greater part of the Huron Sand & Gravel Co. production was gravel for use in paving roads. The remainder of output was filter sand and building sand and gravel. Production of sand for building and a small quantity of molding sand was reported by Greenwich Sand Co. (Greenwich) and Tesmer Sand Co. (Norwalk), respectively.

The Mello-Peat Co. produced peat from a bog near Willard.

**Jackson.**—Coal was mined from 14 strip and 5 underground mines in the county. The principal mine was the strip mine of Broken Aro Coal Co. Some of the larger remaining mines were the strip pits of Waterloo Coal Co., Clinton Coal Co., and Collins & Walton Coal Co.

Fire clay was mined by seven companies, which are listed in order of decreasing production value: Cedar Heights Clay Co., the Pyro Refractories Co., General Refractories Co., Poetker & House Co., Aetna Fire Brick Co., Jefferson Clay Co., and Waterloo Coal Co., all of Oak Hill. Output was used for refractories, agricultural terra cotta, and floor and wall tile.

A small quantity of bank-run gravel was removed from the pit of R & R Coal Co. (Jackson) by the Ohio State Highway Department for use in paving roads.

**Jefferson.**—The most important mineral of Jefferson was coal; the county ranked third in coal production. The principal producing properties were the strip and auger mines of Powhatan Mining Co., the underground mines of Hanna Coal Co., Division of Pittsburgh Consolidation, and the Warner Collieries Co. and the strip pits of Polen Coal Co., Zimnox Coal Co., Pier Coal Co., Teramana Bros. Coal Co., Ohio Edison Co., and Tri-State Coal Co.

Fire clay was mined for heavy clay products and refractories by McLain Fire Brick Co., Division of H. K. Porter Co., Inc., and Frederick J. Dando Co., Irondale; Toronto Fire Brick Co., Stratton; the Kaul Clay Manufacturing Co., and Peerless Clay Corp., Toronto; and Union Clay Manufacturing Corp., Empire. Miscellaneous clay for heavy clay products was also mined by the Kaul Clay Manufacturing Co.

The Iron City Sand & Gravel Corp. and the Duquesne Sand Co. dredged sand and gravel from the Ohio River for building and paving.

Digitized by Google

Fire and furnace sand and a small quantity of gravel was produced by the Brilliant Sand Co. from a fixed plant near Brilliant.

**Knox.**—Quartzite was quarried and ground for use in glass, at foundries, and as a constituent in pottery, porcelain, and tile by The Millwood Sand Co. (Howard).

Sand and gravel, primarily for use in paving roads and for building purposes, was produced by the Fredericktown Sand & Gravel Co., Fredericktown; the Killbuck Sand & Gravel Co., Brinkhaven; J. Harry Baughman, Mount Vernon; and R. D. Melick & Son Gravel Co., Fredericktown. Charles C. Engle sold his operation to L. E. Kearns (Gambier) April 1956. No production was reported by either company for the year. The Knox County engineer produced gravel for paving roads.

**Lake.**—Standard Portland Cement, Division Diamond Alkali Co., continued to manufacture cement at Painesville. The Diamond Alkali Co. also produced brine from wells near Painesville for use in chemicals.

Sand and gravel for building and paving was produced by Leonard Granger (Mentor), the chief producer; and Erie Road Gravel, Eastlake. The most prominent of several small companies reporting gravel for paving roads were Donald R. Keeney, Painesville; and Bradshaw & Thorne, Kirtland.

**Lawrence.**—Limestone was quarried by Alpha Portland Cement Co. (Ironton), for use in its cement-manufacturing plant. The Marquette Cement Manufacturing Co. (Superior) also produced cement in the county. The Lawrence County Highway Department reported limestone produced for concrete and roadstone.

Coal was mined mostly from the underground and strip mines of Collins Mining Co. and the strip mine of Greasy Ridge Coal Co.

Harbison-Walker Refractories Co. (South Webster) was the chief fire-clay producer, followed in order of decreasing value, by International Minerals & Chemical Corp., Eastern Clay Products Department, Pedro; the Carlyle Tile Co., Ironton; Cambria Clay Products Co. and Chaney Mining Co., both of Blackfork; Lawrence Clay Refractories Co., Pedro; and B. & B. Contracting Co., Olive Furnace. The Carlyle Tile Co. also mined miscellaneous clay. County output was used in refractories and floor and wall tile.

The sand and gravel plant of George B. Wilson was sold to The Wilson Sand & Gravel Co., Chesapeake, July 1956; its gravel was produced for paving purposes.

**Licking.**—Building and paving sand and gravel was produced, by Vanatta Gravel Co., Dry Creek Crushed Gravel Co., and North Fork Gravel Co., all of Newark; E. H. Hammond, Granville; Alexandria Sand & Gravel Co., Alexandria; Paul Jones, Newark; and Granville Gravel Co., Granville.

Miscellaneous clay for heavy clay products was mined by The Bowerston Shale Co., Hanover.

**Logan.**—Northwood Stone & Asphalt Co. (Belle Center), National Lime & Stone Co. (East Liberty), and Western Ohio Stone Co. (Huntsville) quarried limestone, which was crushed for use as concrete aggregate for agricultural purposes, riprap, and railroad ballast.

Sand and gravel for building and paving was produced by Neer's

465877—58——57

Digitized by Google

Engineering Laboratories and Moraine Sand & Gravel, Bellefontaine; National Lime & Stone Co., Findlay; and Quincy Hardware & Supply, Quincy. C. E. Duff & Son (Huntsville) reported opening a new plant, to go into operation in 1957.

**Lorain.**—Lorain County ranked third in value of stone output owing to the high productivity of the Cleveland Quarries sandstone quarry at Amherst. Production was used for architectural purposes, flagging, curbing, riprap, refractories, concrete and roadstone, and at foundries. The Nicholl Stone Co. quarried sandstone for architectural purposes and also produced grindstones at Kipton.

The Lorain Elyria Sand Co. (Lorain) produced sand for paving, building, and for use as fill.

**Lucas.**—A large quantity of cement was manufactured at the Medusa Portland Cement Co. plant at Toledo. Limestone was quarried by the company near Silica for use in manufacturing cement. Companies reporting limestone production for use as concrete aggregate and for agricultural purposes, railroad ballast, and riprap were Maumee Stone Co., Maumee; Toledo Stone & Glass Sand Co., Sylvania; and the France Stone Co. (two quarries) at Waterville and Holland. The Holland plant was demolished by fire during the year, and the company reported operations closed indefinitely.

Sand was dredged from the Maumee River near Toledo for building purposes by Maritime Trades, Inc., the Lake Sand & Gravel Co., and Lake Erie Sand & Transport Co.

**Madison.**—Sand and gravel for building and paving was produced near West Jefferson by the West Jefferson Sand & Gravel Co. The Ohio State Highway Department produced paving gravel.

The Madison Tile Co. mined miscellaneous clay for heavy clay products from an open pit near London.

**Mahoning.**—Limestone was quarried and crushed by the Carbon Limestone Co. near Poland Township. Output was used mostly for metallurgical work (blast-furnace flux and foundries), and as concrete aggregate for agricultural purposes, dust for coal mines, mineral food, asphalt, and poultry grit.

All coal was mined from strip pits. The leading producers, in order of decreasing tonnage, were the Marshall Mining Co., the Earl Fairfield Coal Co., Keller Mines, Inc., DeLauter Coal Co., Poland Coal Co., Sunnyside Coal Mining Co., and the Carbon Limestone Co.

The American Fire Clay & Products Co. (Canfield) mined a large quantity of fire clay for use in foundries and steelworks and for making refractory cement. The Pen-Hio Clay Co. (Youngstown) and DeLauter Coal Co. (North Lima) produced fire clay for foundries and for lining blast furnances. Miscellaneous clay for heavy clay products was mined by the Alliance Brick Corp. and the Alliance Clay Products Co. (both of Alliance).

Gurlea Sand & Gravel (Salem) produced sand and gravel for building and paving. Sand for paving roads was reported by the Mahoning County Highway Department.

**Marion.**—The National Lime & Stone Co. (the leading producer), J. M. Hamilton & Sons Co. (both of Marion), and Tri-County Limestone Co. (La Rue) produced limestone for use as concrete aggregate, railroad ballast, agricultural purposes, and riprap.

Digitized by Google

Miscellaneous clay for heavy clay products was mined by Marion Brick & Tile Co., Iberia; and the La Rue Tile Co., La Rue.

Building and paving sand and paving gravel was produced by Penry Sand & Gravel Co. The Marion County Highway Department produced gravel for paving roads.

**Medina.**—The principal producers of sand and gravel for building, paving, and fill were Quillin Bros. Construction Co. and M. S. Worth for Lodi Sand & Gravel Co., both of Lodi; and Brunswick Sand & Gravel, Brunswick. A small quantity of filter sand was also reported by Quillin Bros.

Wadsworth Brick & Tile Co. mined miscellaneous clay from an open pit near Wadsworth for heavy clay products.

**Meigs.**—The strip and auger mines of Swisher Coal Co., Goeglein Bros. Coal Co., and Branch Fleming Coal Co. and the strip mine of Raymond Chuckler yielded most of the coal output of the county.

Tri-State Materials Corp. and Richards & Son (both of Pomeroy) produced sand and gravel for building and paving. The State Highway Department produced a small quantity of gravel in the county for paving purposes.

The Pomeroy Salt Corp. (Minersville) and Excelsior Salt Works, Inc. (Pomeroy), produced brine from wells. Output was evaporated by the open-pan method for use principally by feed dealers and meat packers. The Pomeroy Salt Corp. produced natural salines (calcium chloride) from well brines at Minersville.

**Mercer.**—The John W. Karch Stone Co. (Celina) and Rockford Stone Co. (Rockford) quarried limestone for concrete aggregate, agricultural purposes, and riprap.

**Miami.**—Armco Steel Corp., Piqua Quarries (Piqua) quarried a large quantity of limestone for metallurgical work as concrete aggregate, for agricultural purposes, roofing, and light bulbs, rubber and putty filler, and riprap.

Fenton Construction Co. (Troy) and Steiner Washed Sand & Gravel (Ludlow Falls) produced sand and gravel mostly for building and paving purposes. Vandalia Sand & Gravel, Inc. (Tipp City), and Eldean Gravel (Troy) were other producers. Armco Steel Corp. and Laura Gravel Co., former producers, reported no production in 1956. Estey Sand & Gravel Co. sold out early in 1956.

**Monroe.**—Walter L. and Nova A. Christman (the leading producer) and H. F. Zerger (both of Woodsfield) quarried limestone for concrete aggregate and agricultural purposes.

The State highway department reported gravel produced under contract for paving roads.

**Montgomery.**—The value of sand and gravel increased slightly in 1956 over 1955 as the county again ranked third in value of production. By far the leading producer was American Aggregates Corp. (Dayton), followed by Central Sand & Gravel Co., Dayton; Miller Bros., Union; the Keystone Gravel Co., Wysong Gravel Co., John W. Thomas Gravel Co., all of Dayton; and Englewood Sand & Gravel Co., Englewood. Output was used almost enirely for building and paving.

Laura Gravel & Stone Co. (Phillipsburg) and Limestone Dayton Co. (Dayton) reported output of limestone for concrete aggregate, asphalt, agricultural purposes, blast-furnace flux, riprap, and railroad ballast.

Digitized by Google

Perlite was expanded by the Schumacher Industries, Inc. (Dayton).

**Morgan.**—Coal in the county was mined mostly from the strip pit of Central Ohio Coal Co. The underground mine of Simpson Coal & Chemical Corp. and the strip pit of Haines & Lawrence Coal Co. also reported considerable tonnages.

Sand and gravel for paving purposes was reported by Stockport Sand & Gravel Co. A small quantity of gravel was produced by Douglas Ervin. Both operations were near Stockport.

Chesterhill Stone Co. (Hackney) quarried limestone for concrete aggregate.

**Morrow.**—Building sand and paving gravel was produced by Chesterville Sand & Gravel Co. (Chesterville). The county board of commissioners and the State highway department reported gravel production for paving purposes.

**Muskingum.**—Pittsburgh Plate Glass Co. manufactured cement at its East Fultonham (Ohio) plant. Owing to the high productivity of this plant, the county again ranked third in value of cement output. The Columbia Cement Division, Pittsburgh Plate Glass Co., quarried limestone in Newton Township for use in cement. Limestone for concrete aggregate and agricultural purposes was also produced by Sidwell Bros. near Zanesville.

Coal was mined from 16 underground, 9 strip, and 10 auger mines. Even though underground mines were more numerous, strip production constituted three-fourths of output. Production came principally from the strip mines of Central Ohio Coal Co. and Bruns Coal Co., Inc., and the underground mine of Ten X Coal Co.

Building sand and gravel was produced by the Muskingum River Gravel Co. (Duncan Falls). The Zanesville Gravel Co. (Dresden) reported sand and gravel for building, paving, and industrial use.

Quartzite for foundry use was quarried near Zanesville by the Ayers Mineral Co.

Nelson Clay Co. (Roseville) and Tionesta Clay Co. (Zanesville) mined fire clay for stoneware, art pottery, and flowerpots.

**Noble.**—Virtually the entire coal production (99 percent) was strip-mined. Output from auger mines supplied the remainder. The chief producers were Central Ohio Coal Co., Commercial Fuel Co., Bruns Coal Co., Inc., Selway Mining Co., and Boyd & Palmer Construction Co.

Miscellaneous clay (shale) for heavy clay products was mined near Ava by the Ava Brick Co.

James Merry Stone Co. (Caldwell) quarried limestone for use as concrete aggregate and roadstone and for agricultural purposes.

**Ottawa.**—Ottawa was an important area in limestone production and the only source of gypsum in Ohio. Chemstone Corp., Minerals & Chemicals of America, quarried and crushed limestone at Marblehead principally for metallurgical work and for concrete aggregate, agricultural purposes, and riprap. The United States Gypsum Co. at Genoa produced dolomite for concrete aggregate and for use in lime. Its lime works were also at Genoa. Basic, Inc., manufactured lime at Toledo.

Gypsum was produced by the Celotex Corp., Port Clinton, the leading producer; and United States Gypsum Co., Gypsum.

Digitized by Google

**Paulding.**—Consolidated Cement Corp. manufactured cement and quarried limestone for use in the cement plant at the Paulding site. The Auglaize Stone Co. (Oakwood) reported limestone produced and crushed for use as concrete aggregate, blast-furnace flux, and for agricultural purposes.

Miscellaneous clay for heavy clay products was mined by Haviland Clay Works Co., Haviland; and Baughman Tile Co. and Dangler Drain Tile Co., both of Paulding.

**Perry.**—The Coal in Perry County was mined mostly from the strip and auger mines of Sunnyhill Coal Co. Considerable tonnages were also mined from the underground mine of Ohio Land & Railway Co. and the strip pit of Sidwell Bros.

The Central Silica Co. quarried quartzite from an open quarry near Glenford for use in manufacturing glass, pottery, porcelain, and tile and at foundries.

Molding sand was produced by Industrial Minerals Co., Pike Township.

Fire clay was mined by the Claycraft Co., Shawnee; Straitsville Brick Co., Gore; and J. T. Coal Co., New Lexington. Miscellaneous clay was mined by Ludowici-Celadon Co. and Lite-Stone Aggregates Corp., both of New Lexington; the Rush Creek Clay Co., Junction City; and the Belden Brick Co., Somerset. Output of both fire and miscellaneous clays was reported by Logan Clay Products Co., Logan; and Junction City Clay Co., Junction City. County output was used for heavy clay products, refractories, lightweight aggregates, and floor and wall tile.

**Pickaway.**—Sturm & Dillard Co. (Circleville) produced sand and gravel for paving and gravel for railroad ballast. A small quantity of gravel for paving purposes was also produced by William J. Richards and the Ohio State Highway Department.

**Pike.**—Quartzite was quarried and crushed at Beaver by the Harbison-Walker Refractories Co. for use in manufacturing silica brick.

Glass, molding, foundry, refractory, fire and furnace sand and gravel for metallurgical and refractory use was produced by Ohio Minerals Co. (Beaver). The Standard Slag Co. (Sargents) and Scioto Valley Sand & Gravel Co. (Piketon) reported sand and gravel output for building and paving. Sharon Silica Co. produced gravel for metallurgical use.

**Portage.**—Seventeen sand and gravel operations were active in the county in 1956. Of these, the largest were the two fixed plants of Industrial Silica Corp. at Geauga Lake and Garrettsville; the Hugo Sand Co., Kent; the Standard Slag Co., Mantua; Twin Lakes Sand, Inc., Kent; Evans R. Beck, Kent; and Sober Sand & Gravel, Ravenna. County output was used mostly for building and paving although molding sand, fire and furnace sand, grinding and ploishing sand, blast sand, engine sand, and filter sand were reported.

Harbison-Walker Refractories Co. quarried and crushed quartzite at Nelson for use in silica brick.

Coal was strip-mined by Peterson Coal Co., the only producer in the county.

Universal Sewer Pipe Corp. mined miscellaneous clay near Palmyra for heavy clay products.

Digitized by Google

Peat (moss and humus) was produced by Green Oaks Peat Moss Co. from a bog near Ravenna.

**Preble.**—Marble Cliff Quarries manufactured lime at the site of its limestone quarry at Lewisburg. In addition to its use in lime, the limestone was employed as concrete aggregate and roadstone for agricultural purposes and blast-furnace flux.

Sand and gravel for building and paving was produced by White Gravel Co., Camden; and Steiner Washed Sand and Gravel Co., of West Alexandria.

**Putnam.**—Limestone was produced at the quarries of the National Lime & Stone Co., Columbus Grove; the Putnam Stone Co., Ottawa; Ottawa Stone Co., Gilboa; and Schumacher Stone Co., Pandora. The product was used mostly as concrete aggregate. Agricultural purposes and a small quantity for riprap consumed the remainder of production.

Miscellaneous clay for heavy clay products came from the open-pit mines of Snyder Tile Co., Continental; Glandorf Tile Co., Glandorf; Etter Tile & Coal Co., Dupont; and Miller Bros. Clay Works, Ottoville.

**Richland.**—Harvey Fleck & Son, Inc. (Lexington), and the Killbuck Sand & Gravel Co. (Lucas) produced sand and gravel for building and paving. The Killbuck Co. also produced a small quantity of filter sand. Gravel for paving was reported by D. H. Bowman Excavating, Jefferson Township; and Paul Farst, Perrysville.

The Richland Shale Brick Co. and Ohio Lumber and Face Brick Co. (both of Mansfield) mined miscellaneous clay for heavy clay products.

Peat was produced by Foster C. Reynolds and Swank Peat Moss Co. from bogs at Shelby and Shiloh, respectively.

**Ross.**—The foremost producer of sand and gravel was Central States Construction Co. (Chillicothe). Following in order of decreasing value were: Basic Construction Materials Division, New York Coal Co. and Brewer & Brewer Sons, Inc., both of Chillicothe; Miami Gravel Co., Richmond Dale; and the Paint Valley Sand & Gravel Co., Bainbridge. The Paint Valley Co. also quarried limestone for agricultural purposes. Molding sand was produced by Dubois Mineral Co. (Chillicothe).

**Sandusky.**—Sandusky County led in value in the State in both lime and limestone. Lime was manufactured by eight companies, which reported output for use in refractory material, for building, agricultural purposes, for use in glass, paper, and paint, for metallurgical purposes, and for sewage and trade-wastes treatment. Following are the producers listed according to decreasing value: The Dolite Co., Gibsonburg; Ohio Lime Co. and Standard Lime & Cement Co., both of Woodville; the J. E. Baker Co., Millersville; Woodville Lime Products Co., Woodville; National Gypsum Co., the Gibsonburg Lime Products Co., and Basic, Inc., all of Gibsonburg.

Limestone was quarried for a variety of uses, including metallurgical work (flux, refractory material, open-hearth plants), concrete aggregate, agricultural purposes, chemical uses (glass factories, paper mills), as a whiting or whiting substance (paint, putty, and rubber filler, pottery), fertilizer, and poultry grit, and as dust for coal mines. A large volume of output was used in manufacturing lime. Producers

Digitized by Google

were Ohio Lime Co. and Woodville Lime Products Co., both of Woodville; National Gypsum Co., and Gibsonburg Lime Products Co., both of Gibsonburg; the Gottron Bros. Co., Fremont; the J. E. Baker Co., Millersville; Standard Lime & Cement Co., Woodville; the Dolite Co., Gibsonburg; the France Stone Co., Bellevue; and Basic, Inc., Gibsonburg.

Home Sand & Coal Co. dredged sand from the Sandusky River near Fremont for building purposes.

**Scioto.**—Dimension sandstone was quarried near McDermott by the Taylor Stone Co. and Waller Bros. Stone Co. for architectural purposes and flagging.

Fire clay for fire brick and block and refractories was mined by Eastern Clay Products Department International Minerals & Chemical Corp., Lyra; Harbison-Walker Refractories Co., South Webster; the Pyro Refractories Co., Wheelersburg; Aetna Fire Brick Co., Oak Hill; and the Oak Hill Fire Brick Co., South Webster.

**Seneca.**—Basic, Inc. (Maple Grove), reported that its entire production of lime was used in dead-burned dolomite. Limestone was also quarried by the company at Maple Grove for use in lime as well as for metallurgical work, agricultural purposes, and as concrete aggregate and roadstone. Other producers of limestone in the county were the France Co., Bloomville; and Northern Ohio Stone Co., Flat Rock. Output from these companies was used for blast-furnace flux, concrete aggregate, railroad ballast, agricultural purposes, house-stone veneer, and riprap.

Arnold Gerhardstein mined miscellaneous clay for use as draintile from an open pit near St. Stephen.

**Shelby.**—Sidney Sand & Gravel Co. produced virtually all of the sand and gravel in the county for building and paving purposes. Miami River Quarries and Carl Tunks were the other producers. All three operations were near Sidney.

The Miami River Quarries, Inc., also quarried limestone near Sidney. With the exception of a small quantity used for riprap, output was consumed as concrete aggregate.

**Stark.**—Cement was manufactured at Middle Branch by the Diamond Portland Cement Co., which quarried limestone at the same place for use in cement manufacture.

Seventeen strip mines and 1 underground mine supplied the county tonnage of coal. Production came principally from the strip mines of the Truck Coal Co., Tri-Seam Mining, Inc., Magnolia Mining Co., Kroman Coal Co., and the underground mine of the Merrick Coal Co.

Fire and miscellaneous clays were mined by 13 companies, and the county ranked 3d in value of production. The underground and open-pit mines of Natco Corp., an outstanding producer, yielded a large quantity of fire clay. Stark Ceramics, Inc., was also an important producer of fire clay. The mines of both companies were near East Canton. The Alliance Clay Product Co. (Alliance) and Metropolitan Brick Inc. (Canton), were the leading producers of miscellaneous clay. Both fire and miscellaneous clays came from United States Ceramic Tile Co., East Sparta; and Magnolia Mining Co., Waynesburg. County output of clays was used for heavy clay products and floor and wall tile.

Digitized by Google

Except for a small quantity of filter sand and molding sand, sand and gravel was produced mostly for building and paving. The more important producers were Massillon Washed Gravel Co., Navarre; the Standard Slag Co., Massillon; Ray C. Oster, Canton; Uniontown Sand & Gravel Supply, Inc., Uniontown; and Diamond Washed Gravel Co. and Acme Sand & Gravel Co. both of Canton.

Humus peat was produced by Lab Peat Moss Co., Lantz Peat Moss Co., and Sanders Peat Moss Co., all of Canton.

**Summit.**—More minerals were produced in Summit County than in any other area of the State. Of the minerals produced, salt was the leading commodity, and the county led in salt output. Columbia-Southern Chemical Corp. (Barberton) and Diamond Crystal Salt Co. (Akron), reported brine from wells for use in chemicals and for evaporated salt. The Columbia-Southern Chemical Corp. also quarried limestone for use in quicklime and for concrete aggregate and agricultural purposes. Both the limestone quarry and the lime plant were near Barberton.

The leading producers of sand and gravel for building and paving were Rubber City Sand & Gravel Co., Akron; Twinsbury Silica Sand & Gravel, near Bedford; Portage Lake Sand & Gravel Co., Akron; Wilson Sand & Gravel, Peninsula; Busson Bros., Copley; Vanselow & Busson Gravel Co., Akron, and C. A. Heyl; Barberton.

Fire and miscellaneous clays were mined by Robinson Clay Products Co. (Mogadore) for heavy clay products.

H. W. Coddling & Sons continued to produce peat from a bog near Copley.

Perlite was expanded by J. P. Loomis Concrete & Supply Co. (Akron).

The Minnesota Mining & Manufacturing Co. purchased crude iron oxide pigments from the Pyrites Co. (Wilmington, Del.) for red iron oxides.

**Trumbull.**—Sand and gravel was produced at the fixed plant of the Kinsman Sand & Gravel Co. (Kinsman) for building and paving.

**Tuscarawas.**—Clay was recovered from 32 mines, and the county led in value of clay production in the State. Fire clay contributed over 90 percent of the value; miscellaneous clay, the remainder. Leading, in order of decreasing production value were the Evans Pipe Co., Uhrichsville; Goshen Brick & Clay Corp., Newcomerstown; the Ross Clay Product Co., Uhrichsville; Columbia Fire Brick Co., Strasburg; the Belden Brick Co. mines, Sugarcreek and Port Washington; Stone Creek Brick, Stone Creek; Dennison Sewer Pipe Corp., and Superior Clay Corp., both of Uhrichsville; North American Refractories Co., Dover Division, Strasburg; and Davidson Mining, Inc., Midvale. County output was used for heavy clay products, refractories, and floor and wall tile. A small quantity was mined for chemical use.

Coal was mined from deep and strip mines, and Tuscarawas County ranked fourth in the State in production. The underground mine of Columbia-Southern Chemical Corp. was the leading producer, followed by the strip mines of Copperhead Coal Co., Inc., Paul Varga & Sons, Inc., Cross Coal Co., Eberhart Coal, Inc., and Clyde A. Wallick.

Digitized by Google

The Industrial Silica Corp. produced molding sand and fire and furnace sand from a fixed plant at Dundee. The primary producers of sand and gravel for building and paving were Tri-County Gravel Co., Sandyville; Spring Bros., New Philadelphia; Stocker Gravel Plant, Gnadenhutten; and Edgar Spring, Inc., Midvale.

**Union.**—Clymer Materials Co. (Millcreek Township) and H. E. Rockhold & Sons (York Center) quarried and crushed limestone for concrete aggregate and roadstone and for agricultural purposes. A small quantity was also produced for riprap. Clymer Materials Co. also produced sand and gravel for building and paving.

**Van Wert.**—The Union Quarries Co. (Van Wert), the Delphos Quarries Co. (Delphos), and The France Co. (Middlepoint) produced and crushed limestone for road construction, railroad ballast, and agricultural purposes.

Miscellaneous clay was mined for draintile by Delphos Clay Works Co., Delphos (formerly Fred Minzing & Son); and Weck Tile Plant, Van Wert.

**Vinton.**—Benedict, Inc., strip mine was the leading coal property in Vinton County. The underground mines of Todd Bros., Loper Coal Co., and Fuller Coal Co. followed in order of decreasing tonnage.

The McArthur Brick Co. (McArthur) and Hope Fire Clay Co. (Zaleski), mined miscellaneous clay and fire clay, respectively. Output was used for heavy clay products and fire brick and block.

Limestone for concrete aggregate and agricultural purposes was quarried at McArthur by the McArthur Stone & Coal Co.

**Warren.**—Sand and gravel for building and paving was the only commodity produced in Warren County. The leading producers were the Van Camp Sand & Gravel Co., Morrow; Franklin Sand & Gravel Co., Franklin; Armitage & Son Plants, South Lebanon and Waynesville; and William Ceders Gravel Plant, Morrow.

**Washington.**—The strip mines of the Peaker Run Coal Co. and Freedom Coal Co. supplied the county output of coal.

Building and paving sand and gravel was produced by Marietta Concrete Corp. and Ohio River Sand & Gravel Corp. (both of Marietta). Molding sand and gravel for building, paving, and railroad ballast was reported by Briggs Gravel Co. (Marietta). Fred Price Contracting (Waterford), L. C. Riley (Marietta), and the Ohio State Highway Department produced sand and gravel for paving roads.

The Hall Grindstone Co. (Marietta) and Constitution Stone Co. (Constitution) continued producing grindstones.

Miscellaneous clay for use as lightweight aggregate was mined by Marietta Concrete Corp. Briggs Gravel Co. mined a small quantity of fire clay for use at foundries. Both companies mined at Marietta.

**Wayne.**—Evaporated salt was recovered by the open and vacuum-pan methods at Rittman by the Morton Salt Co.

The Mullet Coal & Clay Co. mined coal from two mines (strip and auger), the only coal-producing properties in Wayne County.

By far the leading producer of sand and gravel was Rupp Construction, Inc. (Marshallville). Smaller quantities were reported by Charles Zollinger, Rittman; and P. D. Seibert, Wooster. Output was used in building and paving.

Digitized by Google

Miscellaneous clay for heavy clay products was mined by the Medal Brick & Tile Co., Wooster; and Orville Tile Co., Orville.

**Williams.**—Building sand and gravel was dredged from the St. Joseph River one-half mile from Pioneer by the Tri-State Gravel Co.—the leading producer in Williams County. Building sand was produced by Mason Sand & Gravel Co., Edon; and sand and gravel for paving by Easler Sand & Gravel Co., Edgerton.

The Stryker Drain Tile Co. (Stryker) mined miscellaneous clay for heavy clay products.

**Wood.**—Limestone was quarried mostly for use as concrete aggregate and roadstone and for metallurgical purposes, agricultural use, and riprap. Companies in order of decreasing production value were: Pugh Quarry Co., Custar; National Gypsum Co., Luckey; Wood County Stone & Construction Co., Bowling Green; O. F. Brough, West Millgrove; and the France Stone Co., North Baltimore. The National Gypsum Co. reported part of its output was used in manufacturing lime at its lime plant at the same place.

A small quantity of miscellaneous clay was mined for draintile by the Perrysburg Tile & Brick Co. (Perrysburg).

**Wyandot.**—The National Lime & Stone Co. produced a large quantity of limestone for concrete and roadstone, metallurgical work, railroad ballast, and agricultural purposes, for use in glass factories, and for use in the company lime plant at Carey. The lime was utilized in manufacturing glass and for building and agricultural purposes. Limestone output was also reported by J. L. Foucht (Upper Sandusky) for use as concrete aggregate and in agriculture.

Sand and gravel for building and paving and for use as fill was produced by Wilson Sand Co., Upper Sandusky; and Corfman Gravel Co., Sycamore.

Humus peat was recovered from the bogs of the Humus Co. and Smith Agricultural Chemical Co. (both of Carey).

The Claycraft Co. mined miscellaneous clay from an open pit near Upper Sandusky for heavy clay products.

Digitized by Google

# The Mineral Industry of Oklahoma

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Oklahoma Geological Survey.

By Peter Grandone [1] and William E. Ham [2]

OKLAHOMA mineral production totaled a record of $757 million in 1956 compared with $711 million in 1955 and $650 million in 1954. Production of 13 minerals and 5 mineral fuels was reported from 74 of the State's 77 counties. Compared with other States in 1956, Oklahoma ranked fourth as producer of natural-gas liquids, natural gas, and crude petroleum. Appreciable quantities of zinc, lead, cement, coal, gypsum, sand and gravel, and stone also were produced.

The mineral fuels—petroleum, natural gas, natural-gas liquids, and coal—were the most important minerals in value, furnishing 95 percent of Oklahoma's total value of mineral production. Metals and nonmetals supplied the remaining 5 percent. Petroleum was produced in 58 of Oklahoma's 77 counties, natural gas in 56 counties, nonmetals in 70 counties, and metals (lead and zinc) in Ottawa County only.

**TABLE 1.—Mineral production in Oklahoma, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 724,156 | $726,856 | 705,061 | $701,038 |
| Coal | 2,163,536 | 12,667,563 | 2,006,987 | 12,340,642 |
| Lead (recoverable content of ores, etc.) | 14,126 | 4,209,548 | 12,350 | 3,877,900 |
| Natural gas, million cubic feet | 614,976 | 45,508,000 | 678,603 | 54,288,000 |
| Natural-gas liquids: | | | | |
| Natural gasoline and cycle products, thousand gallons | 504,692 | 28,770,000 | 489,963 | 26,543,000 |
| LP-gases, do | 512,320 | 14,297,000 | 579,101 | 23,427,000 |
| Petroleum (crude), thousand 42-gallon barrels | 202,817 | 563,830,000 | 215,862 | 600,096,000 |
| Pumice | | | 305 | 3,050 |
| Salt (common) | [3] | [3] | 9,980 | 89,764 |
| Sand and gravel | 6,293,798 | 4,785,786 | 5,946,693 | 4,842,506 |
| Stone | 10,933,355 | 12,295,274 | 10,546,612 | 12,416,886 |
| Zinc (recoverable content of ores, etc.) | 41,543 | 10,219,578 | 27,515 | 7,539,110 |
| Value of items that cannot be disclosed: Asphalt (native), bentonite, cement, gypsum, lime, sulfur (recovered elemental) and tripoli | | 15,525,248 | | 12,965,500 |
| Total Oklahoma [2] | | 711,089,000 | | 757,116,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total adjusted to avoid duplicating values of clays and stone.

[1] Commodity-industry analyst, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] Geologist, Oklahoma Geological Survey, Norman, Okla.



Digitized by Google

Oil and natural gas were produced in a wide belt extending from the northeastern part of the State to the southwestern and northwestern parts; nonmetal mining was widely distributed over the northeast, north central, and central regions and in the Arbuckle and Wichita Mountain areas of the southern part.

## CONSUMPTION AND MARKETS

Oklahoma mineral industries processed a significant part of their output into finished and semifinished products for in-State consumption and for out-of-State shipments. These industries included oil refineries; natural gasoline and cycle plants stripping natural gas of condensible liquids; zinc smelters reducing zinc concentrate mined in Oklahoma; brick, tile, pottery, glass, and cement plants using clays, shales, silica sands, and limestone of Oklahoma; and producers of building materials made of Oklahoma gypsum. Large quantities of petroleum and natural gas continued to be transmitted by pipelines to industrial sections of the Eastern and North Central States.

The State regulatory body under the Interstate Oil Compact permitted the allowable production of oil to increase 4 percent above the 1955 allowable to conform with the indicated demand for Oklahoma petroleum. Total production increased 6 percent, as over half of it comes from unallocated fields, including secondary recovery operations.

**TABLE 2.—Average unit value of mineral commodities produced in Oklahoma, 1952–56**

| Commodity | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Asphalt, native ..... short ton | $4.75 | $4.75 | $4.75 | $4.75 | $4.75 |
| Cement: | | | | | |
| Portland ..... 376-pound barrel | 2.47 | 2.54 | 2.64 | 2.72 | 2.89 |
| Masonry ..... do | ---------- | ---------- | ---------- | ---------- | [1] 3.81 |
| Clays: | | | | | |
| Miscellaneous ..... short ton | 1.04 | 1.02 | [2] 1.09 | 1.01 | .99 |
| Bentonite ..... do | 15.00 | 9.64 | 10.00 | 4.50 | 4.50 |
| For cement ..... do | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Coal ..... do | 5.78 | 6.10 | 5.88 | 5.86 | 6.15 |
| Gypsum ..... do | 2.64 | 2.76 | 2.81 | 2.94 | 2.93 |
| Lead ..... pound | .161 | .131 | .137 | .149 | .157 |
| Lime ..... short ton | 10.25 | 8.67 | 9.85 | 9.55 | 11.02 |
| Natural gas ..... 1,000 cubic feet | .054 | .069 | .070 | .074 | .080 |
| Natural-gas liquids: | | | | | |
| Natural gasoline and cycle products per gallon | .073 | .065 | .051 | .057 | .054 |
| LP-gases ..... gallon | .037 | .036 | .030 | .028 | .040 |
| Petroleum ..... 42-gallon barrel | 2.56 | 2.70 | 2.79 | 2.78 | 2.78 |
| Pumice ..... short ton | 9.87 | 9.54 | 8.36 | ---------- | 10.00 |
| Salt (common) ..... do | 7.47 | 7.47 | 7.62 | 7.83 | 8.99 |
| Sand and gravel ..... do | .77 | .85 | .79 | .76 | .81 |
| Stone: | | | | | |
| Granite ..... short ton | 95.76 | 102.34 | 60.40 | [2] 67.91 | 35.33 |
| Sandstone ..... do | 8.37 | .60 | 1.45 | 1.16 | 1.49 |
| Limestone ..... do | 1.09 | 1.07 | 1.08 | 1.15 | 1.23 |
| Miscellaneous (crushed) ..... do | .46 | .41 | .34 | .47 | .58 |
| Sulfur (recovered) ..... long ton | ---------- | [1] 26.74 | 26.50 | 26.63 | [4] 26.64 |
| Tripoli ..... short ton | ---------- | [1] 5.00 | 3.00 | 3.00 | 3.00 |
| Zinc ..... pound | .166 | .115 | .108 | .123 | .137 |

[1] First year reported.
[2] Revised figure.
[3] Dimension granite.
[4] Calculated on a sulfur-content basis.

Digitized by Google

## TRENDS AND DEVELOPMENTS

Demand for Oklahoma crude petroleum showed no appreciable gain until the last month of the year. This was the first noticeable effect of increased shipments of oil to western Europe, which resulted from halting the passage of Middle East oil through the Suez Canal. As a result, production of petroleum gained only 6 percent over the preceding year, and recoverable reserves underwent a slight reduction. Widespread exploratory drilling during the year furnished many significant discoveries, especially in the deep areas of southern, southwestern, and northwestern Oklahoma. Osage County was the scene of the largest number of completions. Harper County, with its multiple pay zones and high initial potentials, gave promise of developing into a major gas reserve. Deep Simpson gas reserves in southern Oklahoma became a reality with the successful completion of the State's deepest well in southeastern Grady County.

In the refining of petroleum the trends continued toward increased capacity for producing premium-grade motor fuel and toward raising the octane rating of motor fuels. The competitive race for upgrading motor fuels was evidenced by new installations for catalytic cracking units and catalytic reformers at refineries at Cushing and Ponca City. The Tide Water Associated Oil Co. refinery at Drumright was shut down in 1955. A 20,000-barrel-per-day refinery at Cushing was to undergo change in ownership and modernization to upgrade product quality.

**Custom Mills and Smelters.**—Six custom mills in Oklahoma treated lead-zinc ores mined locally and from Kansas, and three mine mills treated lead-zinc ores from company mines only.

Three smelting companies operated three horizontal zinc retort plants in Oklahoma in 1956. These were the plants of American Metals Co., Ltd., at Blackwell, Kay County; National Zinc Co. at Bartlesville, Washington County; and Eagle-Picher Co. at Henryetta, Okmulgee County.

**Mineral Brokers.**—Several smelting companies maintained mineral brokers or ore buyers in the Tri-State District of Oklahoma, Kansas, and Southwest Missouri. No metal concentrates were stockpiled at the mines as all production continued to be purchased f. o. b. the mill by the brokers.

## EMPLOYMENT AND INJURIES

**Employment.**—Total employment in the Oklahoma mineral industries increased slightly to an alltime high of 52,300 from the previous year. Distribution of this total employment was 93 percent to oil and gas mining, 2 percent to metals, 2 percent to coal, and 3 percent to nonmetals. Total wages for these mineral industries were $253.9 million, a 9-percent gain over 1955. In addition to the employment for petroleum mining, 17,000 were employed in petroleum refineries and received $70 million in wages during 1956.

**Injuries.**—Accidents reported in coal, metal, and nonmetal mining consisted of 5 fatal and 153 nonfatal injuries. Of these injuries, 3 fatal and 125 nonfatal were in coal mining.

Digitized by Google

TABLE 3.—Employment in mineral industries, 1947–51 (average) and 1952–56[1]

(In thousands)

| | 1947–51 average | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Oil and gas industry | 37.9 | 42.5 | 44.7 | 46.5 | 48.4 | 49.1 |
| Coal mining | 2.1 | 1.5 | 1.5 | 1.3 | 1.3 | 1.1 |
| Other mining | 2.8 | 2.8 | 2.0 | 2.2 | 2.3 | 2.2 |
| Total | 42.8 | 46.8 | 48.2 | 50.0 | 52.0 | 52.4 |

[1] Oklahoma Employment Security Commission, Handbook of Employment Statistics of Oklahoma, 1939–56.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

Oklahoma, fabulous in oil discoveries since the turn of the century, continued to be a leading domestic producer of the Nation's crude petroleum and natural gas and remained a major supplier of refined products. Native asphalt and a substantial quantity of a low-ash bituminous coal also were produced.

**Asphalt (Native).**—Output of native rock asphalt (bituminous limestone and bituminous sandstone) was reported from Murray County. Production in 1956 rose 41 percent over the preceding year.

**Coal.**—Coal production in Oklahoma, which underwent a 6-year decline trend to the end of 1954, gained in 1955 and then dropped 7 percent in 1956. Part of the loss was due to closing of the Lone Star Steel Co. mine near McCurtain following two explosions. The State had 35 operators in 11 counties. Haskell, Rogers, Pittsburg, Le Flore, and Sequoyah Counties were the five principal producers, each reporting over $1 million in value. Total output in 1956 was 2 million short tons valued at $12.3 million.

TABLE 4.—Coal production, 1947–51 (average) and 1952–56

| Year | Thousand short tons | Value | | Year | Thousand short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total (thousand dollars) | Average per ton | | | Total (thousand dollars) | Average per ton |
| 1947–51 (average) | 2,961 | 15,080 | $5.09 | 1954 | 1,915 | 11,265 | $5.88 |
| 1952 | 2,194 | 12,688 | 5.78 | 1955 | 2,164 | 12,668 | 5.86 |
| 1953 | 2,168 | 13,227 | 6.10 | 1956 | 2,007 | 12,341 | 6.15 |

**Natural Gas.**—Oklahoma continued to rank third in the Nation in marketed production of natural gas; it amounted to 679 billion cubic feet valued at $54.3 million—a 10-percent gain in volume and 19 percent in value compared with 1955. Production was reported from 56 counties, chiefly from Texas, Garvin, Beckham, Oklahoma, and Grady, in the order named. The industry continued its search for more reserves by completing 317 gas wells out of a total of 8,052 wells of all types, as reported by the Oil and Gas Journal. Exploratory drilling alone furnished 39 gas discoveries out of 865 exploratory tests. Most promising of this exploratory drilling was in the Anadarko

Digitized by Google

basin, where gas discoveries were made in Harper and Woodward Counties. Deep Simpson gas reserves in southern Oklahoma were tapped in Grady County. Estimated proved recoverable reserves of natural gas increased 4 percent in Oklahoma during 1956 to 13,755,049 million cubic feet, according to the Committee on Natural Gas Reserves of the American Gas Association.[3]

**TABLE 5.—Marketed production of natural gas, 1947–51 (average) and 1952–56**

| Year | Million cubic feet | Value | | Year | Million cubic feet | Value | |
|---|---|---|---|---|---|---|---|
| | | Total (thousand dollars) | Per thousand cubic feet, cents | | | Total (thousand dollars) | Per thousand cubic feet, cents |
| 1947–51 (average) | 471,192 | 22,476 | 4.8 | 1954 | 616,355 | 43,145 | 7.0 |
| 1952 | 554,033 | 29,918 | 5.4 | 1955 | 614,976 | 45,508 | 7.4 |
| 1953 | 509,955 | 41,397 | 6.9 | 1956 | 678,603 | 54,288 | 8.0 |

[1]Comprises gas either sold or consumed by producers, including losses in transmission, quantities added to storage, and increases in gas pipelines.

**Natural-Gas Liquids.**—Production of natural-gas liquids from a total of 76 natural-gasoline plants and 2 cycling plants in Oklahoma amounted to 1,069 million gallons in 1956 and was valued at $50.0 million. This was a year of rapid additions to storage of all light liquids. Demand for LP-gases for fuel was less than had been anticipated, and markets for natural gasoline were depressed by excessive motor-fuel stocks. Natural gasoline and cycle products furnished 46 percent of the quantity and 53 percent of the value, LP-gases the remainder. According to the American Petroleum Institute,[4] estimated proved recoverable reserves of natural-gas liquids in Oklahoma were 355.6 million barrels—a gain of only 1.2 million barrels over 1955 estimates.

**TABLE 6.—Natural-gas liquids produced, 1947–51 (average) and 1952–56**

| Year | Natural gasoline and cycle products | | LP-gases | | Total | |
|---|---|---|---|---|---|---|
| | Thousand gallons | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) |
| 1947–51 (average) | 314,822 | 22,854 | 244,362 | 9,179 | 559,184 | 32,033 |
| 1952 | 405,720 | 29,459 | 376,026 | 14,090 | 781,746 | 43,549 |
| 1953 | 433,650 | 28,066 | 414,036 | 14,886 | 847,686 | 42,952 |
| 1954 | 478,590 | 24,332 | 453,810 | 13,506 | 932,400 | 37,838 |
| 1955 | 504,692 | 28,770 | 512,320 | 14,297 | 1,017,012 | 43,067 |
| 1956 | 489,963 | 26,543 | 579,101 | 23,427 | 1,069,064 | 49,970 |

**Petroleum.**—Oklahoma remained the Nation's fourth ranking producer of petroleum in 1956, with an output of 216 million barrels valued at $600.1 million. This 6-percent increase in production over 1955 still did not reach the 1927 record, when oil was allowed to flow unabated without State conservation laws. Petroleum was reported from 58 counties; the 5 leading producers were Garvin, Osage, Carter,

[3] American Gas Association and American Petroleum Institute, Proved Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas: Dec. 31, 1955, vol. 11, p. 19.
[4] Work cited in footnote 3, p. 5.

Digitized by Google

Stephens, and Creek. Over half of the 1956 production came from nonallocated fields, which include secondary-recovery projects.

The average price per barrel of petroleum at the wells was $2.78 in 1956, the same as in 1955. According to the Oil and Gas Journal, a total of 8,056 wells was drilled in Oklahoma in 1956; of these, 4,825 were oil wells, 2,476 were dry, and the remainder were either gas or service wells. The search for more oil led to the drilling of 867 test wells in 1956, third highest in the Nation. These 867 tests compared with 832 in 1955 and included 154 oil-productive and 41 gas-productive wells. Also, these tests discovered 93 oilfields and 39 gasfields, according to the Mid-Continent Oil & Gas Association.

Exploratory crews made many significant discoveries during the year. Success was widespread at depth in southern, southwestern, and northwestern Oklahoma. The Anadarko basin and the counties on and adjacent to the Nemaha granite ridge were the scenes of much exploratory activity. Osage County, first in both exploratory and field development wells, furnished 16 new fields out of 18 successful exploratory wells. The drive for natural gas was intense in Beaver County, which ranked second with 13 new fields, followed by Payne with 7 fields, and McClain with 5 fields. At the year end special attention was centered on Cleveland County, where three deep pools were tapped.

**TABLE 7.—Production of petroleum (crude), 1947–51 (average) and 1952–56**

| Year | Thousand 42-gallon barrels | Value | | Year | Thousand 42-gallon barrels | Value | |
|---|---|---|---|---|---|---|---|
| | | At wells (thousand dollars) | Average per barrel | | | At wells (thousand dollars) | Average per barrel |
| 1947–51 (average) | 159,720 | 392,154 | $2.46 | 1954 | 185,851 | 518,520 | $2.79 |
| 1952 | 190,435 | 487,510 | 2.56 | 1955 | 202,817 | 563,830 | 2.78 |
| 1953 | 202,570 | 546,940 | 2.70 | 1956 | 215,862 | 600,096 | 2.78 |

**TABLE 8.—Indicated demand, production, and stocks of petroleum (crude) in 1956, by months**

| Month | Thousand 42-gallon barrels | | | Month | Thousand 42-gallon barrels | | |
|---|---|---|---|---|---|---|---|
| | Indicated demand | Production | Stocks originating in Oklahoma | | Indicated demand | Production | Stocks originating in Oklahoma |
| January | 18,164 | 18,778 | 22,373 | September | 17,670 | 17,485 | 25,653 |
| February | 16,669 | 17,919 | 23,625 | October | 17,615 | 17,141 | 25,261 |
| March | 18,438 | 19,324 | 24,511 | November | 17,908 | 17,075 | 24,517 |
| April | 16,374 | 17,880 | 25,870 | December | 20,397 | 18,896 | 23,016 |
| May | 17,369 | 17,850 | 26,207 | | | | |
| June | 17,441 | 17,529 | 26,158 | Total: 1956 | 213,632 | 215,862 | |
| July | 17,069 | 17,980 | 26,879 | 1955 | 205,349 | 202,817 | |
| August | 18,518 | 18,005 | 26,366 | | | | |

Oklahoma's depth record (14,510 feet) was made by British-American Oil Producing Co. in the Knox field, Grady County. This discovery set off a deep search throughout the southern part of the vast Anadarko basin and is considered 1 of the 3 top discoveries of

Digitized by Google

the year in the Mid-Continent region. The estimated proved reserve of crude oil in Oklahoma was reported by the American Petroleum Institute at 2 billion barrels—6 million barrels less than 1955 estimates.

The indicated demand for total petroleum in 1956 was 213.6 million barrels compared with 205.3 million barrels in 1955. Crude-oil stocks, originating in the State, on December 31, 1956, totaled 23 million barrels, or 3 million more than the indicated demand.

At the end of 1956 there were 15 refineries operating, with a total daily crude-oil capacity of 352,000 barrels, and 2 inactive refineries.

**TABLE 9.—Production of crude petroleum, 1952–56, by fields, in thousand barrels**

[Oil and Gas Journal]

| Field | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Allen | 1,336 | 1,456 | 1,709 | 1,733 | 1,638 |
| Bebee | 1,244 | 1,087 | 926 | 836 | 745 |
| Burbank | 3,157 | 3,476 | [1] 3,466 | [2] 10,139 | [2] 13,519 |
| Cache Creek | 1,042 | 956 | 787 | 707 | 661 |
| Camp | 975 | 1,606 | 1,329 | ([4]) | ([4]) |
| Cement | 3,964 | 4,070 | 3,517 | 4,186 | 4,372 |
| Cumberland | 3,102 | 2,562 | 1,690 | 1,841 | 1,944 |
| Cushing | 2,889 | 3,385 | 3,176 | 2,823 | 2,549 |
| Dilworth | ([3]) | ([3]) | 1,279 | 1,135 | 921 |
| Doyle | 2,475 | 3,934 | 2,976 | 2,683 | 3,056 |
| Elk City | 7,248 | 6,380 | 5,348 | 6,277 | 5,326 |
| Eola | 1,178 | 1,651 | 1,424 | [5] 2,193 | [5] 3,566 |
| Fox-Graham | 5,532 | 5,920 | 4,559 | ([4]) | ([4]) |
| Glenn | 2,252 | 2,145 | 2,045 | 1,983 | 1,901 |
| Healdton | 2,183 | 2,288 | 2,171 | 2,307 | 2,347 |
| Hewitt | 3,173 | 2,703 | [6] 3,339 | [6] 3,411 | [6] 3,495 |
| Holdenville-East | ([3]) | ([3]) | 1,149 | [7] 1,476 | [7] 1,117 |
| Hoover-Northwest | 693 | 601 | [8] 1,189 | [8] 1,662 | [8] 2,063 |
| Knox | 1,627 | 1,595 | 1,165 | 1,143 | 1,291 |
| Milroy | 1,091 | 2,325 | 1,755 | ([4]) | ([4]) |
| Oklahoma City | 5,513 | 5,187 | 4,148 | 3,803 | 3,743 |
| Olympic | 2,013 | 4,064 | 4,083 | 2,662 | 1,752 |
| Payson-East | ([3]) | 1,725 | 1,076 | [10] 918 | [10] 786 |
| Ringwood | 1,338 | 855 | 727 | 551 | 484 |
| Seminole: | | | | | |
| Bowlegs | 1,003 | 1,121 | 872 | 718 | 685 |
| Little River | 852 | 826 | 756 | 699 | 571 |
| St. Louis | 1,440 | 1,507 | 1,464 | 1,672 | 1,486 |
| Seminole | 1,077 | 1,211 | 998 | 921 | 827 |
| Sholem-Alechem | 12,239 | 12,736 | 10,261 | ([4]) | ([4]) |
| Sho-Vel-Tum | | | | [4] 30,316 | [4] 29,717 |
| South Burbank | 617 | 894 | 1,429 | ([3]) | ([3]) |
| Tatums | 3,466 | 3,892 | 3,321 | ([4]) | ([4]) |
| Velma-West | 18,999 | 16,064 | 8,435 | ([4]) | ([4]) |
| West Edmond | 4,471 | 1,887 | [11] 1,821 | 1,733 | 1,945 |
| Witcher | 1,120 | 660 | 541 | 439 | 378 |
| Yale-Quay | 1,891 | 2,171 | 1,915 | 1,479 | 1,322 |
| Other fields | 90,323 | [12] 99,630 | [12] 99,005 | [12] 110,371 | [12] 121,655 |
| Total Oklahoma | 191,523 | [12] 202,570 | [12] 185,851 | [12] 202,817 | [12] 215,862 |

[1] Includes Burbank South and Fairfax.
[2] Includes Burbank, Burbank South, Little Chief, Northeast, and Little Chief, West, consolidated in 1955.
[3] Included with "Other fields."
[4] Included with Sho-Vel-Tum. The following pools were consolidated in 1955: Alma, North; Alma, Northeast; Alma, Southwest; Ava; Ava, North; Ava, Northwest; Camp; Camp, Southeast; Fox-Graham; Milroy; Milroy, West; Sholem-Alechem; Sholem-Alechem, Northwest; Sholem-Alechem, Southwest; Sholem-Alechem, West; Tatums; Velma; and Wheeler.
[5] Includes Eola, North and Eola, Northwest; consolidated in 1955.
[6] Includes Brockwest and Lone Grove, Southwest.
[7] Includes Grief Creek.
[8] Includes Hoover, North; Brady, Southeast; and Roady, Northeast.
[9] Includes Holdenville, East, and Holdenville, West; consolidated in 1955.
[10] Includes Payson, consolidated in 1955.
[11] Includes Edmond, Northwest, and Lockridge, Northeast.
[12] Bureau of Mines data.

465877—58——58

Digitized by Google

**TABLE 10.—Capacity of petroleum refineries and cracking plants, Jan. 1, 1957**

(Barrels per day)

| Company | Location | County | Type of plant | Crude-oil capacity | | Cracked-gasoline capacity | |
|---|---|---|---|---|---|---|---|
| | | | | Operating | Shutdown | Operating | Shutdown |
| Allied Materials Corp. | Stroud | Lincoln | Skimming and asphalt. | 3,000 | | | |
| Anderson-Prichard Oil Corp. | Cyril | Caddo | Skimming, cracking, and asphalt. | 11,000 | | 4,000 | |
| Bell Oil & Gas Co. | Grandfield | Tillman | Skimming and cracking. | 8,000 | | 5,800 | |
| Ben Franklin Refining Co. | Ardmore | Carter | Skimming, cracking, and asphalt. | 13,000 | | 8,000 | |
| Champlin Refining Co. | Enid | Garfield | Complete | 20,000 | | 12,400 | |
| Cities Service Oil Co. | Ponca City | Kay | do | 23,000 | | 7,400 | |
| Continental Oil Co. | do | do | do | 58,000 | | 16,690 | 1,650 |
| D-X Sunray Oil Co. | Duncan | Stephens | do | 37,000 | 6,000 | 28,000 | |
| Do | West Tulsa | Tulsa | Skimming, cracking, and lube. | 73,000 | | 34,500 | 1,000 |
| Kerr-McGee Oil Industries, Inc. | Cleveland | Pawnee | Skimming and cracking. | | 6,500 | 1,800 | 3,500 |
| Do | Cushing | Payne | Complete | 22,000 | | 5,250 | |
| Do | Wynnewood. | Garvin | Skimming, cracking, and asphalt. | 17,000 | | 4,900 | |
| Midland Cooperatives, Inc. | Cushing | Payne | Skimming and cracking. | 12,000 | | 5,140 | |
| Monarch Refineries, Inc. | Oklahoma City. | Oklahoma | Skimming and asphalt. | 1,000 | | | |
| Phillips Petroleum Co. | Okmulgee | Okmulgee | Skimming and cracking. | 19,000 | | 4,300 | |
| The Texas Co. | West Tulsa | Tulsa | do | 35,000 | | 22,500 | |
| Tide Water Associated Oil Co. | Drumright. | Creek | do | | 15,000 | | 4,300 |
| Total | | | | 352,000 | 27,500 | 160,680 | 10,450 |

In the refining industry of Oklahoma, upgrading of motor fuels was continued by the installations of more cracking and re-forming capacity and by the closing of two small refineries. Johnson Oil Refining Co. at Cleveland sold its pipeline gathering system to Kerr-McGee Oil Industries, Inc., and shut down its refinery in March. Wilcox Oil Co. shut down its 5,500-barrel-per-day refinery at Bristow because of inability to compete in the high-octane-gasoline race. The company sold 200 miles of crude-oil gathering lines to Mid-Continent Pipeline Co. and will continue marketing products manufactured by D–X Sunray Oil Co.

Midland Co-operatives, Inc., put a new platformer (platinum re-former) unit in operation at its Cushing (Okla.) refinery. The 3,000-barrel-per-day re-former will upgrade gasoline produced at the refinery.

Anderson-Prichard Oil Corp. was expanding its Cyril (Okla.) refinery capacity from 11,500 to 13,500 barrels of crude oil per day and also was adding a fluid-cracking capacity of 11,000 barrels per day. Cities Service Oil Co. was expanding its Ponca City, Okla., plant capacity from 23,500 to 35,000 barrels per day. A 6,500-barrel-per-day re-forming unit was under construction.

Digitized by Google

**TABLE 11.—Oil and gas wells drilled in 1956, by counties [1]**

| County | Proved field wells | | | Exploratory wells | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oil | Gas | Dry | Oil | Gas | Dry | Oil | Gas | Dry |
| Alfalfa | 19 | 1 | 3 | 4 | | 14 | 23 | 1 | 17 |
| Atoka | | | 1 | | | 7 | | | 8 |
| Beaver | 36 | 27 | 18 | 8 | 17 | 9 | 44 | 44 | 27 |
| Beckham | 6 | 3 | 8 | 1 | 1 | 6 | 7 | 4 | 14 |
| Blaine | | | | | | 2 | | | 2 |
| Bryan | | | | 1 | | 8 | 1 | | 8 |
| Caddo | 163 | 2 | 44 | 7 | 2 | 10 | 170 | 4 | 54 |
| Canadian | | | 1 | 1 | 1 | 2 | 1 | 1 | 3 |
| Carter | 297 | 8 | 81 | 6 | | 12 | 303 | 8 | 93 |
| Cherokee | | | | | | 4 | | | 4 |
| Choctaw | | | | | | 2 | | | 2 |
| Cimarron | 5 | 15 | 3 | 1 | | 6 | 6 | 15 | 9 |
| Cleveland | 160 | | 21 | 3 | | 16 | 163 | | 37 |
| Coal | 11 | | 6 | | | 8 | 11 | | 14 |
| Comanche | 56 | 8 | 51 | 1 | | 20 | 57 | 8 | 71 |
| Cotton | 7 | | 13 | | | 13 | 7 | | 26 |
| Craig | | | | 1 | | 2 | 1 | | 2 |
| Creek | 382 | 10 | 189 | 4 | 1 | 10 | 386 | 11 | 199 |
| Delaware | 1 | | | | | 2 | 1 | | 2 |
| Garfield | 70 | 1 | 43 | 3 | | 16 | 73 | 1 | 59 |
| Garvin | 316 | 3 | 82 | 12 | | 16 | 328 | 3 | 98 |
| Grady | 84 | 9 | 26 | 3 | | 6 | 87 | 9 | 32 |
| Grant | 39 | 4 | 9 | 11 | 1 | 28 | 50 | 5 | 37 |
| Greer | 14 | | 18 | | | 9 | 14 | | 27 |
| Harmon | | | | | | 1 | | | 1 |
| Harper | 12 | 5 | | 4 | 3 | 5 | 16 | 8 | 5 |
| Haskell | | 1 | | | | | | 1 | |
| Hughes | 77 | 53 | 63 | 1 | 4 | 7 | 78 | 57 | 70 |
| Jackson | 7 | | 8 | | | 7 | 7 | | 15 |
| Jefferson | 13 | | 26 | 1 | | 24 | 14 | | 50 |
| Johnston | | | 1 | | | 2 | | | 3 |
| Kay | 98 | 3 | 55 | 3 | | 24 | 101 | 3 | 79 |
| Kingfisher | 4 | | 2 | 3 | | 1 | 7 | | 3 |
| Kiowa | 29 | 2 | 34 | 3 | | 29 | 32 | 2 | 63 |
| Le Flore | | 1 | 1 | | | 3 | | 1 | 4 |
| Lincoln | 177 | 18 | 81 | 4 | | 25 | 181 | 18 | 106 |
| Logan | 113 | 4 | 35 | 1 | | 23 | 114 | 4 | 58 |
| Love | 27 | | 11 | 1 | | 3 | 28 | | 14 |
| Marshall | 58 | 1 | 21 | 2 | | 4 | 60 | 1 | 25 |
| Mayes | | | | | | 1 | | | 1 |
| McClain | 16 | | 11 | 6 | 1 | 7 | 22 | 1 | 18 |
| McCurtain | | | 1 | | | 1 | | | 2 |
| McIntosh | | | 1 | | 1 | 1 | | 1 | 2 |
| Murray | 2 | | 2 | | | 18 | 2 | | 20 |
| Muskogee | 8 | | 12 | | | 2 | 8 | | 14 |
| Noble | 93 | 5 | 55 | 6 | | 15 | 99 | 5 | 70 |
| Nowata | 2 | | 2 | | | | 2 | | 2 |
| Okfuskee | 105 | 9 | 69 | 2 | 1 | 8 | 107 | 10 | 77 |
| Oklahoma | 37 | 1 | 17 | 2 | | 10 | 39 | 1 | 27 |
| Okmulgee | 184 | 7 | 183 | | | | 184 | 7 | 183 |
| Osage | 1,015 | 3 | 411 | 16 | 2 | 79 | 1,031 | 5 | 490 |
| Ottawa | | | | | | 1 | | | 1 |
| Pawnee | 98 | 1 | 72 | | | 34 | 98 | 1 | 106 |
| Payne | 132 | 8 | 78 | 8 | | 17 | 140 | 8 | 95 |
| Pittsburg | | | | | | 3 | | | 3 |
| Pontotoc | 111 | 6 | 72 | | | 12 | 111 | 6 | 84 |
| Pottawatomie | 54 | 1 | 47 | 3 | | 14 | 57 | 1 | 61 |
| Pushmataha | | | | | | 1 | | | 1 |
| Rogers | 14 | | 11 | | | 1 | 14 | | 12 |
| Seminole | 143 | 1 | 69 | 2 | | 6 | 145 | 1 | 75 |
| Sequoyah | | | | | | 3 | | | 3 |
| Stephens | 265 | 15 | 103 | 5 | | 14 | 270 | 15 | 117 |
| Texas | 9 | 38 | 10 | 5 | 2 | 9 | 14 | 40 | 19 |
| Tillman | 60 | | 24 | 8 | | 23 | 68 | | 47 |
| Tulsa | 28 | | 8 | | | | 28 | | 8 |
| Wagoner | 8 | | 21 | | | | 8 | | 21 |
| Washington | 1 | | 1 | | | | 1 | | 1 |
| Washita | 3 | 1 | 2 | | | 2 | 3 | 1 | 4 |
| Woods | 2 | 3 | 1 | 1 | 2 | 2 | 3 | 5 | 3 |
| Woodward | | | | | | 2 | | | 2 |
| Total: 1956 | 4,671 | 280 | [2] 2,238 | [3] 154 | 41 | 672 | 4,825 | 321 | [2] 2,910 |
| 1955 | 4,977 | 328 | 2,274 | 154 | 31 | 647 | 5,131 | 359 | 2,921 |

[1] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957.
[2] Includes 434 service wells.
[3] Includes 24 distillate wells.

Digitized by Google

## METALS

Output of metallic minerals in 1956 continued to decline for the third consecutive year owing to depletion of the higher grade ore and to increasing imports of concentrates and slab zinc. Production loss of zinc was attributed mainly to cutbacks in the automotive industry, a principal consumer of this metal. The value of lead and zinc totaled $11.4 million, declining 21 percent from 1955. Government stockpile buying of lead and zinc had a stabilizing effect on prices.

**Cadmium, Germanium, Indium, and Gallium.**—These minor metals, occurring as trace elements in Oklahoma lead-zinc concentrates, were recovered from the flue and zinc dusts of zinc-retort smelters and from the precipitates of electrolytic zinc smelters. Production of these metals could not be assigned to a State of origin, because they were recovered at the smelters from the accumulated flue dusts and residues of ores from various domestic and foreign sources.

**Lead.**—Mine production of lead, all from Ottawa County, was 8 percent less than in 1955 in concentrates and 13 percent less in recoverable metal. The value of the 12,350 short tons of recoverable lead produced in 1956 was $3.9 million, a loss of 8 percent from the 1955 value. The chief producer of lead in Oklahoma was Eagle-Picher Co., followed by American Zinc, Lead & Smelting Co.

The price of lead opened the year at 16.0 cents per pound, New York, rose to 16.5 cents in January, dropped back to 16.0 cents the same month, and remained unchanged to the end of the year.

**Manganese.**—Wayne Misner Ore Co. announced discovery of manganese in the Kiamichi area, Pushmataha County. The Kiamichi strike was reported to be higher grade ore and in larger quantities than the manganese being mined in Arkansas.

**Uranium.**—Prospecting for and occurrence of radio-active mineralization was reported in Roger Mills and Le Flore Counties. A uranium discovery near Cheyenne, Okla., where ore was reported to be valued at $60 a ton, was inspected by an Atomic Energy Commission geologist.

**TABLE 12.—Mine production of lead and zinc, 1947–51 (average), 1952–56, and total 1891–1956, in terms of concentrates and recoverable metals [1]**

| Year | Lead concentrate (galena) | | Zinc concentrate (sphalerite) | | Recoverable metal content [2] | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lead | | Zinc | |
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 23,656 | $4,553,617 | 89,422 | $8,966,116 | 17,673 | $5,555,487 | 47,821 | $13,532,650 |
| 1952 | 20,473 | 4,104,934 | 101,726 | 11,714,605 | 15,137 | 4,874,114 | 54,916 | 18,232,112 |
| 1953 | 12,213 | 1,915,195 | 61,896 | 4,541,616 | 9,304 | 2,437,648 | 33,413 | 7,684,990 |
| 1954 | 19,004 | 3,194,245 | 84,444 | 5,466,727 | 14,204 | 3,891,896 | 43,171 | 9,324,936 |
| 1955 | 19,555 | 3,368,713 | 78,726 | 5,997,071 | 14,126 | 4,209,548 | 41,543 | 10,219,578 |
| 1956 | 17,971 | 3,225,015 | 52,993 | 4,485,122 | 12,350 | 3,877,900 | 27,515 | 7,539,110 |
| 1891–1956 | 1,657,395 | 159,975,445 | 9,694,067 | 479,249,276 | 1,272,276 | 191,135,097 | 5,110,897 | 767,195,674 |

[1] Based on Oklahoma ore ("dirt") and old tailings treated at mills during calendar year indicated.

[2] In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal, it should be noted that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

Digitized by Google

**Zinc.**—Mine production of recoverable zinc, all in Ottawa County, declined 34 percent from the preceding year to 27,515 tons, although metal prices remained steady during 1956. Zinc output valued at $7.5 million declined 26 percent from the 1955 value. Eagle-Picher Co. was the principal producer in the State, followed by American Zinc, Lead & Smelting Co., Buffalo Mining Co., C. & M. Mining, and Contack Mining Co., Inc.

Zinc-metal price at the beginning of 1956 was quoted at 13.0 cents per pound, East St. Louis, rose to 13.5 cents per pound on January 6, 1956, and remained stable to the end of the year.

Three zinc-retort smelters in Oklahoma operated in 1956. They were American Metals Co., Ltd., at Blackwell, Kay County; Eagle-Picher Co., at Henryetta, Okmulgee County; and National Zinc Co., at Bartlesville, Washington County.

**TABLE 13.—Tenor of lead and zinc ore milled and concentrates produced, 1955–56**

| | 1955 | 1956 |
|---|---|---|
| Total material milled ..... short tons | 3,007,235 | 1,755,607 |
| Recovery of concentrate and metal from material milled: | | |
| Galena ..... short tons | 19,555 | 17,971 |
| Sphalerite ..... do | 78,726 | 52,993 |
| Galena ..... percent | 0.65 | 1.02 |
| Sphalerite ..... do | 2.62 | 3.02 |
| Lead [1] ..... do | 0.47 | 0.70 |
| Zinc [1] ..... do | 1.38 | 1.57 |
| Average lead content of galena concentrate ..... do | 73.72 | 70.11 |
| Average zinc content of sphalerite concentrate ..... do | 57.36 | 57.69 |
| Average value per ton: | | |
| Galena concentrate | $172.27 | $179.46 |
| Sphalerite concentrate | $76.18 | $84.64 |

[1] Figures represent metal content of the crude ore (dirt) only insofar as it is recovered in the concentrate. Data on tailing losses not available.

**TABLE 14.—Mine production of lead and zinc in 1956, by months, in terms of recoverable metals**

| Month | Lead (short tons) | Zinc (short tons) | Month | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 973 | 2,835 | August | 992 | 2,122 |
| February | 1,083 | 2,660 | September | 929 | 1,829 |
| March | 1,199 | 3,002 | October | 1,059 | 2,077 |
| April | 969 | 2,017 | November | 1,136 | 2,190 |
| May | 1,104 | 2,364 | December | 944 | 1,956 |
| June | 1,048 | 2,286 | | | |
| July | 914 | 2,177 | Total | 12,350 | 27,515 |

**TABLE 15.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1956 [1]**

| Zinc concentrate | | Lead concentrate | |
|---|---|---|---|
| Week ended— | Price per short ton | Week ended— | Price per short ton |
| Jan. 1–Jan. 7 | $80.00 | Jan. 1–Jan. 4 | $202.25 |
| Jan. 9–Dec. 31 | 84.00 | Jan. 5–Jan. 15 | 208.52 |
| | | Jan. 15–Dec. 31 | 201.32 |

[1] E&MJ Metal & Mineral Markets.

Digitized by Google

A Bureau of Mines report dealing with the recovery of germanium and cadmium from Oklahoma zinc ore was published during the year.[5]

## TRI-STATE DISTRICT

The Tri-State district of Oklahoma, Kansas, and Southwest Missouri produced 3.6 million tons of crude ore in 1956 compared with 4.1 million tons in 1955. This crude ore yielded 28,597 tons of lead concentrate, which contained 20,373 tons of recoverable lead; and 107,997 tons of zinc concentrate, which contained 57,215 tons of recoverable zinc. Lead concentrate recovered was up 6 percent, and zinc concentrate recovered was down 18 percent from 1955 recoveries.

**TABLE 16.—Mine production of lead and zinc concentrates in the Tri-State district, 1947–51 (average) and 1952–56**

| Year | Lead concentrate (galena) | | Zinc concentrate (sphalerite) | | Recoverable metal content | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lead | | Zinc | |
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 37,271 | $7,236,837 | 166,227 | $16,425,167 | 28,017 | $8,818,457 | 88,983 | $24,946,096 |
| 1952 | 36,333 | 7,388,754 | 167,474 | 19,537,949 | 27,356 | 8,808,632 | 90,512 | 30,049,984 |
| 1953 | 17,403 | 2,715,987 | 102,821 | 7,455,540 | 13,273 | 3,477,526 | 55,729 | 12,817,670 |
| 1954 | 24,497 | 4,127,232 | [1] 127,053 | 8,483,611 | 18,314 | 5,018,036 | [2] 64,322 | 13,893,552 |
| 1955 | [3] 26,992 | 4,734,339 | [4] 131,026 | 10,052,448 | [4] 19,679 | 5,864,342 | [6] 69,696 | 17,145,216 |
| 1956: | | | | | | | | |
| Kansas | 10,130 | 1,955,278 | 53,142 | 4,688,130 | 7,635 | 2,397,390 | 28,665 | 7,854,210 |
| Southwest Missouri | 496 | 102,096 | 1,862 | 161,502 | 388 | 121,832 | 1,035 | 283,590 |
| Oklahoma | 17,971 | 3,225,015 | 52,993 | 4,485,122 | 12,350 | 3,877,900 | 27,515 | 7,539,110 |
| Total: 1956 | 28,597 | 5,282,389 | 107,997 | 9,334,754 | 20,373 | 6,397,122 | 57,215 | 15,676,910 |

[1] Includes 360 tons from old tailing remilled.
[2] Includes 194 tons from old tailing remilled.
[3] Includes 2,736 tons from old tailing remilled.
[4] Includes 44 tons from old tailing remilled.
[5] Includes 256 tons from old tailing remilled.

**TABLE 17.—Tenor of lead and zinc ore milled and concentrate produced in Tri-State district, 1952–56**

| | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Total material milled: | | | | | |
| Crude ore—short tons | 6,140,155 | 3,454,980 | 4,092,278 | 4,140,281 | 3,584,902 |
| Tailings and slimes—do | 604,350 | ---------- | 18,000 | 486,280 | ---------- |
| Recovery of concentrate and metal from material milled: | | | | | |
| Galena—percent | 0.54 | 0.50 | 0.60 | 0.58 | 0.80 |
| Sphalerite—do | 2.48 | 2.98 | 3.09 | 2.83 | 3.01 |
| Lead [1]—do | 0.41 | 0.38 | 0.45 | 0.43 | 0.57 |
| Zinc [1]—do | 1.34 | 1.61 | 1.56 | 1.51 | 1.60 |
| Average lead content of galena concentrate—percent | 76.79 | 77.81 | 76.28 | 74.41 | 72.69 |
| Average zinc content of sphalerite concentrate—percent | 60.04 | 60.22 | 56.24 | 59.09 | 58.87 |
| Average value per ton: | | | | | |
| Galena concentrate | $203.36 | $156.06 | $168.48 | $175.40 | $184.72 |
| Sphalerite concentrate | $116.66 | $72.51 | $66.77 | $76.72 | $86.44 |

[1] Figures represent metal content of the crude ore (dirt) only insofar as it is recovered in the concentrate.

[5] Kenworthy, H., Starliper, A. G., and Ollar, A., Laboratory Recovery of Germanium and Cadmium in Sphalerite Concentrates: Bureau of Mines Rept. of Investigations 5190, 1956, 17 pp.

Digitized by Google

Oklahoma furnished 63 percent of the district's lead concentrate and 49 percent of its zinc concentrate; Kansas supplied 35 percent of the district's lead concentrate and 49 percent of its zinc concentrate; Southwest Missouri furnished 2 percent of the district's lead concentrate and 2 percent of its zinc concentrate. The district's combined lead-zinc concentrate recovery of 3.81 percent in 1956 compared with a combined lead-zinc concentrate recovery of 3.41 percent in 1955.

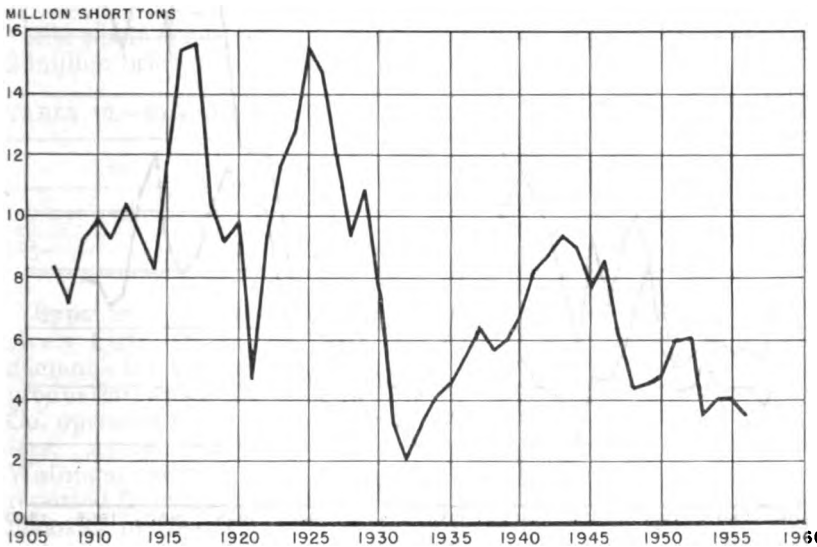



FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907–56.

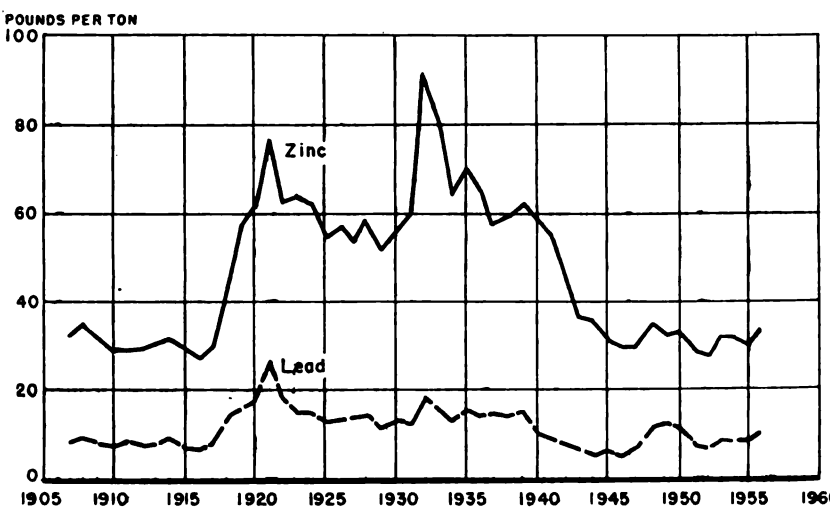



FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907–56.

Digitized by Google

FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907–56.

## NONMETALS

Oklahoma, endowed with abundant resources of nonmetals, yielded $28.6 million worth in 1956 compared with the record $31.3 million produced in 1955. A return to a more normal rate of construction activity accounted for most of the reduction. Also, a 96-day labor stoppage at one of the State's 2 cement plants caused an 85,000-ton production loss. Despite these reversals, the 1956 value of nonmetals was 11 percent higher than the 1954 value.

Individual commodity alltime high values in 1956 were those for sand and gravel, stone, lime, and common salt.

**Cement.**—Cement, the product ranking second in value of nonmetals produced in Oklahoma, underwent a one-fifth reduction from 1955. Two plants (at Dewey in Washington County and at Ada in Pontotoc County) operated throughout 1956. A third plant was being built near Locust Grove, Mayes County, by the Ozark Portland Cement Co., Inc. (formerly Hercules Cement Co.). This plant, with planned capacity of 1,500 barrels daily, is near a deposit reported to contain a 100-year supply of limestone.

**Clays.**—Oklahoma has extensive clay resources. Production was used principally in manufacturing brick and tile and to a small extent for manufacturing portland cement and lightweight, expanded-clay

Digitized by Google

products. Brick and tile were produced in Creek, Custer, Garfield, Greer, Lincoln, Oklahoma, Pittsburg, Seminole, and Tulsa Counties. Bentonite was produced in Dewey County. Expanded lightweight aggregate was made from clay in Tulsa and Oklahoma Counties.

Clays sold or used in 1956, including clays used for cement, totaled 705,000 tons, valued at $701,000. This tonnage was slightly less than in 1955. The Stroud Clay Products Co. in Lincoln County, which was idle for 3 years, changed management and underwent extensive remodeling and expansion. By the end of the year, this 1-kiln plant expected to be operating 8 kilns, with a total capacity of 2 million brick yearly.

**TABLE 18.—Clays sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 524,055 | $433,677 | 1954 | 452,050 | $1,282,848 |
| 1952 | 520,050 | 577,420 | 1955 | 724,156 | 726,856 |
| 1953 | 577,556 | 637,082 | 1956 | 705,061 | 701,038 |

**Gypsum.**—Tonnage and value of gypsum in 1956 remained relatively high—about the same as in 1955—in response to continued demands for wallboard, plasters, and portland cement. Most of the production was from Blaine County, where the United States Gypsum Co. operated quarries and plants to manufacture wallboard and plasters. At Southard, Universal Atlas Cement Co. quarried near Watonga, and S. A. Walton quarried near Southard. Production was reported from Caddo County for the first time. A survey of gypsum deposits in the area of Weatherford and Clinton (Custer County) was completed by the Oklahoma Geological Survey. The survey showed gypsum deposits suitable for manufacturing wallboard and plaster in enough quantity to meet the needs of the entire Nation for 130 years at the 1956 rate of consumption of 10 million tons annually.

**Lime.**—The entire lime production in the State came from the St. Claire Lime Co. in Sequoyah County and was slightly less in quantity than in the 1955 record year; however, the value increased 14 percent.

**Pumice.**—Production of pumice in 1956 reported by one operator in Beaver County, was comparable with the production and value in 1954. No pumice was produced in 1955. B. M. Sayler, Jr., announced purchase of a mine in Harper County. The deposit is close enough to the surface to permit open-pit mining and will be reopened. A promising use for the material is a filler for fertilizers.

**Salt.**—Output of salt—reported by 3 producers in 3 counties—increased 12 percent over 1955. At Sayre in Beckham County, salt continued to be produced by injecting fresh water through wells into a salt bed and recovering the brine for surface evaporation. In Woods County salt was produced from surface encrustations on the Big Salt Plain of the Cimarron River, and in Harmon County it was recovered by solar evaporation of brine from springs. Principal uses were for stock food and for recharging water softeners.

**Sand and Gravel.**—Sand and gravel deposits, suitable for concrete aggregate and road surfacing, occur along and adjacent to most of the

Digitized by Google

larger streams in Oklahoma. Production was reported from 57 counties in the State in 1956. Johnston, Tulsa, Cherokee, Pontotoc, Logan, and Murray were the leading counties, supplying half the total value.

Most of the sand and gravel produced in Oklahoma was used for paving concrete and mortar. Second in tonnage and value was high-purity glass sand, produced at two plants in the Arbuckle Mountain district. In addition to glass manufacturing a small part of the high-purity sand was used as foundry sand and for making sodium silicate.

Sand and gravel (including glass sand) produced in Oklahoma during 1956 amounted to 5.9 million tons valued at $4.8 million.

**TABLE 19.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Commercial | | Government-and-contractor | | Total sand and gravel | | Average value per ton |
|---|---|---|---|---|---|---|---|
| | Thousand short tons | Value (thousand dollars) | Thousand short tons | Value (thousand dollars) | Thousand short tons | Value (thousand dollars) | |
| 1947–51 (average) | 1,672 | 1,371 | 941 | 312 | 2,613 | 1,683 | $0.64 |
| 1952 | 2,354 | 2,209 | 1,416 | 703 | 3,770 | 2,912 | .77 |
| 1953 | 2,998 | 2,928 | 2,014 | 1,331 | 5,011 | 4,259 | .85 |
| 1954 | 3,211 | 3,380 | 2,213 | 885 | 5,424 | 4,266 | .79 |
| 1955 | 3,654 | 3,719 | 2,640 | 1,067 | 6,294 | 4,786 | .76 |
| 1956 | 3,417 | 3,886 | 2,530 | 957 | 5,947 | 4,843 | .81 |

**Stone.**—Oklahoma stone producers in 1956 reported 10.5 million tons of crushed limestone, crushed granite, dimension granite, dimension sandstone, dimension limestone, crushed sandstone, and miscellaneous stone. The reported value ($12.4 million) showed little change from 1955. Production was reported from 31 counties; Tulsa, Comanche, Murray, and Ottawa supplied most of the stone tonnage in the State. Crushed limestone (reported by 19 producers at 34 quarries in 1956) was used principally for cement and for concrete aggregate, and road construction.

Chat, included with miscellaneous stone, denotes coarse tailing from milling zinc and lead ores. The material is mostly chert or microcrystalline silica and small quantities of limestone, sphalerite, galena, marcasite, and pyrite. Most of the chat sold was used for railroad ballast, concrete aggregate, and road surfacing. In 1956 operators reported 35 percent more tonnage than in 1955.

*Granite.*—The dimension-granite industry of Oklahoma is centered in the Wichita Mountains in the southwestern part of the State, where 5 producers operated 6 quarries in Greer, Johnston, and Kiowa Counties in 1956. Crushed granite was produced at one quarry in Kiowa County.

Production came from Precambrian granites, which are predominantly pink and red. Dimension granite was used mostly for monumental stone and partly for exterior trim. Much of the stone was finished in plants in the Wichita Mountains, and some was shipped as rough rock to other States. In 1956, production of dimension was reported to be 5,074 tons with a value of $522,570.

Digitized by Google

**TABLE 20.—Stone sold or used by producers, 1952–56, by kinds**

| Year | Granite | | Limestone | | Sandstone | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | 5,337 | $511,073 | [1] 6,355,780 | [1] $6,940,219 | 1,350 | $11,300 |
| 1953 | [2] 6,862 | [2] 702,250 | [2] 5,654,022 | 6,029,258 | 228,897 | 137,407 |
| 1954 | 11,022 | 665,753 | [1 3] 6,974,697 | [1 3] 7,527,413 | 160,883 | 233,469 |
| 1955 | 576,187 | 1,276,088 | [1 3] 8,826,553 | [1 3] 10,123,738 | 236,778 | 275,702 |
| 1956 | [4] 5,074 | [4] 522,570 | [1 3] 8,626,450 | [1 3] 10,603,022 | 152,518 | 227,464 |

| Year | Other stone | | Total | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| 1952 | 3,274,008 | $1,511,742 | [1] 9,636,475 | [1] $8,974,334 |
| 1953 | 2,600,213 | 1,061,822 | [2] 8,489,994 | [2] 7,930,737 |
| 1954 | 2,092,209 | 720,360 | [1 2] 9,238,811 | [1 2] 9,146,995 |
| 1955 | 1,293,837 | 619,746 | [2] 10,933,355 | [2] 12,295,274 |
| 1956 | 1,762,570 | 1,063,830 | [2] 10,546,612 | [2] 12,416,886 |

[1] Excludes dimension limestone.
[2] Revised figures.
[3] Includes limestone used in cement and lime.
[4] Excludes crushed granite.

*Limestone and Dolomite.*—In 1956 limestone and dolomite were quarried in 23 counties; the largest production came from Tulsa, Comanche, and Murray Counties.

Chemical-grade limestone was quarried at Marble City in Sequoyah County for limemaking and for use as flux in glass manufacturing, fertilizers, and mineral feeds.

Dimension limestone was quarried for building stone in the Arbuckle Mountains in Pontotoc County, in Caddo County, and near Eldorado in Jackson County; limestone for portland cement was quarried in Washington and Pontotoc Counties.

*Sandstone.*—Dimension sandstone produced in Oklahoma was used for building and veneer stone in building construction. The stone was cut in slabs 1¼ to 6 inches thick from shallow, open-face quarries in Okmulgee, Sequoyah, Maynes, and Pushmataha Counties. Approximately 1,000 tons valued at $12,000 was produced in 1956.

*Stone, Crushed (Government-and-Contractor).*—Stone crushed by municipal, county, and State agencies included limestone and sandstone obtained from local quarries through the State.

**Sulfur (Recovered Elemental).**—Decreases of 11 percent on both tonnage and value of sulfur produced from waste natural gases by Joe L. Parker at Madill, Marshall County, were reported in 1956.

**Tripoli.**—Eighteen percent less tripoli was mined in eastern Ottawa County in 1956 than in 1955. All of the tripoli mined was shipped to Seneca, Mo., for processing by the American Tripoli Division of the Carborundum Co. and sold chiefly for buffing compounds and foundry use.

## REVIEW BY COUNTIES

Production of metals, nonmetals, and mineral fuels was reported from 74 of the 77 Oklahoma counties. Adair, Ellis, and Roger Mills were the only nonproducing counties.

Digitized by Google

**Alfalfa.**—A small quantity of petroleum was produced from the McWillie, N. field, and 4 of the 18 exploratory wells drilled proved oil productive. Construction sand and gravel was produced by Earl Kirkpatrick; other sand and gravel was produced by the county and State highway departments.

**Atoka.**—Limestone was crushed at the Southwest Stone Co. quarry near Stringtown for use as railroad ballast, road base, and aggregate in concrete. A small quantity of petroleum was produced west of Wesley. Seven exploratory wells were drilled; all proved dry.

**Beaver.**—Construction sand was quarried from a pit east of Beaver City by Everett Bush. Petroleum and natural gas were produced mainly from the Greenough, Floris, Camp Creek, and Light fields. Drilling of 34 test wells resulted in 8 that were oil productive and 17 that were gas productive. Stay-Ready Laboratories of Oklahoma City, Okla., prepared to mine a deposit of almost pure volcanic ash near Gate. The deposit (an estimated 5 million tons) has been known for 30 years and has been mined intermittently.

**TABLE 21.—Value of mineral production in Oklahoma 1955–56 by counties[1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adair | (2) | | |
| Alfalfa | $50,222 | $365,295 | Petroleum, sand and gravel, natural gas. |
| Atoka | 289,871 | 257,951 | Stone, petroleum, sand and gravel. |
| Beaver | 2,148,831 | 2,936,262 | Petroleum, natural gas, sand and gravel, pumicite. |
| Beckham | 26,060,772 | 22,683,546 | Petroleum, natural-gas liquids, natural gas, salt. |
| Blaine | (2) | (2) | Gypsum. |
| Bryan | 2,016,431 | 1,840,464 | Petroleum, sand and gravel, natural gas. |
| Caddo | 13,887,291 | 13,831,911 | Petroleum, natural gas, gypsum, sand and gravel, stone. |
| Canadian | 353,414 | 328,248 | Petroleum, natural gas, sand and gravel. |
| Carter | 58,949,629 | 61,641,664 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Cherokee | (2) | 534,420 | Sand and gravel, stone. |
| Choctaw | (2) | 23,449 | Sand and gravel. |
| Cimarron | 1,447,760 | 1,647,715 | Natural gas, petroleum, sand and gravel. |
| Cleveland | 7,947,487 | 13,684,376 | Petroleum, natural gas, natural-gas liquids. |
| Coal | 2,205,728 | 1,978,215 | Petroleum, stone, natural gas, coal, sand and gravel. |
| Comanche | 2,550,103 | 2,517,057 | Stone, petroleum, sand and gravel, natural gas. |
| Cotton | 4,813,058 | 4,418,543 | Petroleum, sand and gravel, natural gas. |
| Craig | 110,753 | 221,153 | Coal, stone, petroleum, natural gas. |
| Creek | 31,276,145 | 31,031,687 | Petroleum, natural-gas liquids, natural gas, clays, sand and gravel. |
| Custer | (2) | 367,402 | Natural-gas liquids, clays. |
| Delaware | (2) | 18,090 | Stone. |
| Dewey | (2) | (2) | Bentonite, sand and gravel. |
| Ellis | (2) | | |
| Garfield | 7,278,812 | 7,783,835 | Petroleum, natural-gas liquids, natural gas, clays. |
| Garvin | 81,626,943 | 99,725,969 | Petroleum, natural-gas liquids, natural gas, stone sand and gravel. |
| Grady | 16,735,306 | 21,789,241 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Grant | 1,783,855 | 1,991,254 | Petroleum, natural gas. |
| Greer | 189,002 | 509,539 | Petroleum, stone, clays, sand and gravel. |
| Harmon | 174,122 | 18,200 | Salt. |
| Harper | 25,935 | 43,549 | Natural gas, petroleum, sand and gravel. |
| Haskell | 4,189,584 | 2,617,127 | Coal, natural gas. |
| Hughes | 12,822,773 | 10,603,304 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Jackson | 1,964,499 | 1,006,593 | Petroleum, natural-gas liquids, natural gas, stone. |
| Jefferson | 2,362,831 | 3,205,422 | Petroleum, natural gas. |
| Johnston | 1,278,097 | 1,812,645 | Sand and gravel, stone. |
| Kay | 12,519,079 | 12,119,080 | Petroleum, natural-gas liquids, natural gas, stone, sand and gravel. |
| Kingfisher | 1,146,063 | 875,729 | Petroleum, sand and gravel, natural gas. |
| Kiowa | 965,988 | 1,143,126 | Stone, petroleum, sand and gravel, natural gas. |
| Latimer | 315,801 | 389,150 | Coal, natural gas, sand and gravel. |
| Le Flore | 2,102,590 | 2,380,770 | Do. |
| Lincoln | 24,268,790 | 25,064,864 | Petroleum, natural-gas liquids, natural gas, stone, clays. |

See footnotes at end of table.

Digitized by Google

**TABLE 21.—Value of mineral production in Oklahoma 1955–56 by counties [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Logan | $10,347,395 | $10,932,125 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Love | 534,706 | 1,132,533 | Petroleum, stone. |
| Major | 2,865,231 | 2,310,055 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Marshall | 5,694,620 | 8,007,989 | Petroleum, natural-gas liquids, natural gas, recovered sulfur, stone, sand and gravel. |
| Mayes | 115,346 | 7,009 | Stone, petroleum, sand and gravel. |
| McClain | 6,570,047 | 7,274,912 | Petroleum, natural gas, sand and gravel. |
| McCurtain | 254,370 | 136,025 | Sand and gravel. |
| McIntosh | 628,929 | 680,503 | Coal, petroleum, natural gas, sand and gravel. |
| Murray | 2,007,591 | 2,140,311 | Stone, asphalt, sand and gravel, petroleum, natural-gas liquids. |
| Muskogee | 1,492,850 | 937,479 | Petroleum, sand and gravel, natural gas. |
| Noble | 8,871,939 | 9,676,220 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Nowata | 13,683,708 | 15,681,295 | Petroleum, stone, natural gas. |
| Okfuskee | 11,971,541 | 10,132,686 | Petroleum, natural gas, natural-gas liquids, stone, sand and gravel. |
| Oklahoma | 35,248,226 | 35,065,312 | Petroleum, natural-gas liquids, natural gas, sand and gravel, clays. |
| Okmulgee | 7,680,766 | 7,821,495 | Petroleum, coal, natural gas, stone. |
| Osage | 56,223,179 | 68,558,343 | Petroleum, natural-gas liquids, stone, natural gas, sand and gravel. |
| Ottawa | 15,153,134 | 12,511,898 | Zinc, lead, stone, tripoli, sand and gravel. |
| Pawnee | 6,845,128 | 7,946,312 | Petroleum, sand and gravel, natural-gas liquids, natural gas. |
| Payne | 13,386,137 | 13,448,121 | Petroleum, natural gas, sand and gravel. |
| Pittsburg | 2,014,983 | 2,373,938 | Coal, natural gas, stone, clays, sand and gravel, petroleum. |
| Pontotoc | 18,784,928 | 17,436,733 | Petroleum, cement, natural-gas liquids, sand and gravel, natural gas, stone. |
| Pottawatomie | 12,830,112 | 16,227,843 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Pushmataha | 222,750 | 53,763 | Sand and gravel, stone. |
| Rogers | 4,720,823 | 5,649,402 | Petroleum, coal, stone, clays, sand and gravel, natural gas. |
| Seminole | 33,293,324 | 28,532,761 | Petroleum, natural-gas liquids, natural gas, clays, sand and gravel. |
| Sequoyah | 1,416,971 | 2,786,748 | Coal, lime, stone, natural gas, sand and gravel. |
| Stephens | 57,929,516 | 59,003,172 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Texas | 21,584,128 | 26,852,160 | Natural gas, natural-gas liquids, petroleum, sand and gravel. |
| Tillman | 862,774 | 1,638,025 | Petroleum, sand and gravel. |
| Tulsa | 6,523,799 | 7,082,548 | Petroleum, stone, sand and gravel, clays, natural gas, natural-gas liquids. |
| Wagoner | 1,108,834 | 1,165,168 | Petroleum, stone, sand and gravel, coal, natural gas. |
| Washington | 20,002,323 | 16,749,979 | Petroleum, cement, stone, natural gas. |
| Washita | 1,780,224 | 1,694,564 | Petroleum, natural gas, sand and gravel. |
| Woods | 787,314 | 665,988 | Natural gas, petroleum, sand and gravel, salt. |
| Woodward | (2) | 2,855 | Sand and gravel. |
| Undistributed | 1,794,869 | 1,393,122 | |
| Total | 711,089,000 | 757,116,000 | |

[1] Roger Mills County not listed, because no production was reported.
[2] Included with "Undistributed" to avoid disclosing individual company confidential data.

**Beckham.**—Salt was produced from wells southwest of Sayre by the Oklahoma Salt Industries, Inc. Petroleum and natural gas were produced from four fields, but mostly from the Elk City field. Natural-gas liquids were produced by the Shell Oil Co. Exploratory crews completed 1 oil well and 1 gas well.

**Blaine.**—Northeast of Watonga, gypsum was produced by Universal Atlas Cement Co., and west of Okeene by S. A. Walton & Sons. United States Gypsum Co. also quarried and crushed gypsum and operated a large calcining, sheet rock, and plaster plant at Southard.

**Bryan.**—Sand and gravel for paving was produced from the pits near Colbert by the State highway department. Petroleum and

Digitized by Google

natural gas were produced from the Aylesworth, S. E. field. Only 1 of 9 exploratory wells proved oil productive.

**Caddo.**—Petroleum and natural gas were produced from three fields. Cement (the largest of these fields) produced 4.4 million barrels of oil in 1956. Drilling of 19 exploratory wells proved 7 oil and 2 gas wells. The plant of Apache Gasoline Co. was shut down. Construction sand and gravel was produced by two operators and for highways by the State highway department. Dimension limestone was quarried by one operator. Gypsum was produced by the Harrison Gypsum Co.

**Canadian.**—Petroleum and natural gas were produced from the Edmond, W. field. Exploratory drilling furnished 1 oil well and 1 gas well. Construction sand and gravel was produced by Tindel Material Co.

**Carter.**—Carter County dropped from second to third in the value of mineral and mineral fuels produced in the State. Petroleum and natural gas were produced from 20 fields of which Fox-Graham, Healdton, Hewitt, Sholeum-Alechem, and Tatums were the largest. Natural-gas liquids were produced by the Magnolia Petroleum Co., Shell Oil Co., Signal Oil & Gas Co., Harry Ells, Inc., Apache Gasoline Co., and Sokla Gasoline Co. Six exploratory wells were completed as oil wells; 12 were dry. Paving sand and gravel was produced by the State highway department.

**Cimarron.**—Petroleum and natural gas were produced from several small fields in the Keys area. Only 1 of 7 exploratory wells drilled proved oil productive. Construction sand and gravel was produced northwest of Boise City by Jack Parker; paving gravel was produced by the State highway department.

**Cleveland.**—Petroleum and natural gas were produced from 19 fields. Natural-gas liquids were produced by Sunray Mid-Continent Petroleum Corp. Drilling of 19 exploratory wells resulted in 3 oil producers and 16 dry holes.

**Coal.**—Petroleum and natural gas were produced from five fields. Eight exploratory wells were drilled; all were dry holes. Paving gravel was produced by the State highway department, and limestone for concrete aggregate was quarried and crushed by one operator. Coal was mined by one producer in 1956.

**Comanche.**—Crushed limestone was produced by the Dolese Bros. Co. from its Richard Spur quarry north of Lawton. Paving sand and gravel was produced by the State highway department. Petroleum and natural gas were produced from a group of small fields comprising three districts and the Fort Sill Reservation field. Only 1 of 21 exploratory wells drilled proved oil productive.

**Cotton.**—Petroleum and natural gas were produced from a group of fields in the Walters and Cache Creek districts and from five other fields. The entire 13 exploratory wells drilled proved to be dry. A small quantity of sand and gravel was produced by the State highway department.

**Craig.**—Coal was strip-mined at 4 pits by 2 producers. Small quantities of petroleum and natural gas were produced. Three exploratory wells were drilled; 1 was oil productive. Limestone was crushed by a construction company.

**Creek.**—Petroleum and natural gas were produced from 51 fields,

Digitized by Google

of these, the prolific Cushing and Glenn fields supplied 4.4 million barrels of petroleum during the year. Natural-gas liquids were recovered by plants of Sinclair Oil & Gas Co., Kerr-McGee Oil Industries, Inc., Pure Oil Co., Gulf Oil Corp., and Sunray Mid-Continent Oil Corp. Exploratory drilling resulted in 4 oil wells and 1 gas well. Sunray Mid-Continent Oil Corp. shut down its gasoline plant at Drumright because of declining gas volumes. Wilcox Oil Co. refinery at Bristow was shut down, and Tide Water Associated Oil Co. refinery at Drumright (shut down in 1955) was dismantled. Clay for manufacturing brick and tile was produced at the Sapulpa plant of the Sapulpa Brick & Tile Co.; for pottery it was produced at Sapulpa by Frankhoma Pottery Co. A small quantity of sand and gravel was produced for highway purposes.

**Garfield.**—Petroleum and natural gas were produced from 26 fields. Natural-gas liquids were produced by the plants of Sterling Oil Co of Oklahoma near the East Spring Valley field and by Sinclair Oil & Gas Co. at Covington. A 9,000-barrel-per-day catalytic cracking unit, placed in operation at the Enid refinery of Champlin Refining Co., completed a $4 million expansion program begun in 1955. Exploratory drilling furnished 3 oil wells and 16 dry holes. The Davies Brick & Tile Co. continued to produce miscellaneous clay for manufacturing brick at its quarry south of Enid.

**Garvin.**—Garvin County retained first position in the value of minerals and mineral fuels produced in the State. Petroleum and natural gas were produced from the 44 fields, which supplied 30.8 million barrels of oil in 1956. Natural-gas liquids were recovered by Sohio Petroleum Co., Lone Star Gas Co., Otha H. Grimes, and Warren Petroleum Co. Exploratory drilling resulted in 12 oil wells and 16 dry holes. Construction sand and gravel was obtained from deposits east of Pauls Valley by two operators; paving sand and gravel and crushed limestone were produced for highways by the highway department.

**Grady.**—Petroleum and natural gas were produced from 11 fields. Natural-gas liquids were recovered by Magnolia Petroleum Co. Three of the nine exploratory wells drilled proved oil productive. Sand and gravel for construction was obtained from pits near Tuttle by the Dolese Bros. Co. and for paving by the State highway department.

**Grant.**—Petroleum and natural gas were produced from 10 fields. Exploratory drilling resulted in 11 oil wells, 1 gas well, and 28 dry holes.

**Greer.**—Granite was quarried by the Granite Monument Works near the town of Granite. Clay was produced from the pit of Mangum Brick & Tile Co., south of Mangum. Construction sand and gravel was produced by four operators. Petroleum was produced from the Lake Creek oilfield. Drilling of nine exploratory wells all proved to be dry holes.

**Harmon.**—Salt was produced by W. W. Flowers & Sons Salt Co. by solar evaporation of brine from salt springs. Only one exploratory well for petroleum was drilled, and it was dry.

**Harper.**—Small quantities of petroleum, natural gas, and stone were produced. Four oil wells and 3 gas wells were productive out of 12 exploratory tests. Sand and gravel was produced for highways.

Digitized by Google

**Haskell.**—Haskell County led in value of coal produced. Coal was mined underground by Dock Coal Co., and strip-mined by Garland Coal Mining Co., Cedar Creek Coal, Fall River Mining Co., Cary Contracting Co., and Choctaw Coal Co., Inc. Natural gas was produced from Quinton and Kinta districts.

**Hughes.**—Petroleum and natural gas were produced from 39 fields. The Holdenville, East field, discovered in 1946, furnished 1.1 million barrels of oil. Natural-gas liquids were recovered by the Grimes Gasoline Co. Exploratory drilling supplied 1 oil well and 4 gas wells. Sand and gravel was produced for highways.

**Jackson.**—Petroleum and natural gas were produced from five fields to the southeast of Altus. Seven exploratory wells all proved dry. Natural-gas liquids were recovered by the plant of Gulf Oil Corp. Dimension limestone was quarried by Eldorado Building Stone Co.

**Jefferson.**—Petroleum and natural gas were produced from eight fields. Of 25 exploratory wells drilled, only 1 proved oil productive.

**Johnston.**—Pennsylvania Glass Sand Corp. of Oklahoma continued to produce glass sand and ground silica from pits north of Mill Creek. Construction sand from a pit east of Tishomingo and paving sand and gravel were produced for highways. Crushed dolomite and dimension granite were produced from quarries near Troy.

**Kay.**—Petroleum and natural gas were produced from 29 fields and natural-gas liquids were recovered by the plant of Cities Service Oil Co. Exploratory drilling resulted in 3 oil wells and 24 dry holes. Cities Service Oil Co. was expanding the capacity of its Ponca City refinery from 23,500 to 35,000 barrels daily, and construction was in progress on a new Rexformer unit. Crushed limestone was produced by Cookson Stone Co. from its quarry northeast of Ponca City and by Mervine Stone Co. Sand and gravel was produced for construction by three operators and for paving by the State highway department. American Metal Co., Ltd., zinc smelter at Blackwell operated continuously throughout the year.

**Kingfisher.**—Construction sand and gravel was produced from pits near Dover. Petroleum and natural gas were produced from three fields: Cashion, NW.; Dover, SW.; and Edmond, W. Four exploratory wells were drilled, and three were oil productive.

**Kiowa.**—Dimension granite was quarried near Snyder by 2 operators and near Mountain Park by 2 operators. Crushed granite also was produced. Construction sand and gravel was produced by two operators; paving sand and gravel by the State highway department. Petroleum and natural gas were produced from nine fields.

**Latimer.**—Coal was strip-mined by Kinta Stripping Co. and mined underground by Limestone Prairie Coal Co. Natural gas was produced from the Red Oak and Morris fields. Paving sand and gravel was produced for highways.

**Le Flore.**—Coal was mined by 11 operators, 4 strip-mined, and the rest mined underground. In value, the county ranked third as a coal producer in the State. Crushed sandstone was produced by the Dixie Material Co., Inc.; sand and gravel was produced for highway surfacing. Natural gas was produced mainly from three fields. Uranium prospectors were active near the Arkansas State line. Interest in uranium also was high near Talihina, and in the Potatoe Hill area a company scheduled a core-drilling test.

Digitized by Google

**Lincoln.**—Petroleum and natural gas were produced from 71 fields, of which the East Payson field produced about 786,000 barrels in 1956. Natural-gas liquids were recovered by the Highway Gasoline Co., Magnolia Petroleum Co., and Moran Gasoline Corp. Extensive exploratory drilling in the county resulted in 4 oil wells and 25 dry holes. Crushed sandstone was produced for concrete aggregate.

The plant of Stroud Clay Products Co. was purchased by Troy Ragland of W & R Stone Co. of Austin, Tex., and extensive remodeling was under way. The plant, formerly shut down and equipped with 1 kiln, expected to be operating 8 kilns with a capacity of 2 million brick yearly.

**Logan.**—Petroleum and natural gas were produced from 41 fields, and natural-gas liquids were recovered by the Eason Oil Co. Twenty-four test wells were drilled, and only 1 was oil productive. Construction sand was produced by two operators.

**Major.**—Petroleum and natural gas were produced from the Ringwood and Seiling, NE. fields. Natural-gas liquids were recovered by Warren Petroleum Co. at Ringwood. Construction sand and gravel was produced near Cleo Springs by two operators.

**Marshall.**—Of 6 fields producing petroleum, the Cumberland yielded 1.9 million barrels in 1956. Natural-gas liquids were recovered by the Warren Petroleum Corp. and the Universal Gasoline Co. Sulfur from waste sour gas was recovered by the Joe E. Parker plant east of Madill. Two of six exploratory wells drilled were oil productive. Sand and gravel and crushed limestone were produced for highways.

**McClain.**—Petroleum and natural gas were produced from 27 fields, and by exploratory drilling 6 oil wells and 1 gas well were discovered. Sand and gravel for paving was produced by the State highway department.

**McIntosh.**—Coal was strip-mined by Leavell Coal Co. Petroleum and natural gas were produced from the Coalton and Morris fields. Sand and gravel was produced for highways.

**Murray.**—Asphaltic limestone and sandstone were produced near Dougherty by the United States Asphalt Corp. The Dolese Bros. Co. crushed limestone at the Rayford and Big Canyon quarries. Construction gravel was produced by Makins Sand & Gravel Co. near Dougherty; paving sand was produced for highways. Petroleum was produced from the Sulphur, NW. field. Eighteen exploratory wells all proved dry.

**Muskogee.**—Petroleum and natural gas were produced from 12 fields. Yahola Sand & Gravel Co. pumped sand and gravel from the Arkansas River north of Muskogee. At Muskogee, Fansteel Corp. began constructing a new $6.5 million columbium-tantalum plant.

**Noble.**—Petroleum and natural gas were produced from 27 fields, and natural-gas liquids were recovered by the Lucien Unit plant of the Gasoline Plant Management Co. Six exploratory wells were found oil productive out of 21 tests. Sand and gravel was produced by the Noble County Highway Department.

**Nowata.**—Petroleum and natural gas were produced from six fields. Peerless Rock Co. crushed limestone.

**Okfuskee.**—Petroleum and natural gas were produced from 72 fields; the Olympic field supplied 1.75 million barrels of oil in 1956. Natural-gas liquids were recovered by two plants of Grimes & Grimes.

465877—58——59

Digitized by Google

Two oil-discovery wells and one gas-discovery well were completed. Sand and gravel for highways and crushed sandstone for concrete aggregate were produced.

**Oklahoma.**—Of the 23 fields that produced petroleum and natural gas, Oklahoma City and West Edmond each produced more than 1 million barrels of oil. Natural-gas liquids were recovered by Patton & Swab, Inc., Phillips Petroleum Co., and Cities Service Oil Co. Two oil-discovery wells were completed. Clay for manufacturing brick and tile was obtained from pits in the western part of Oklahoma City by the Acme Brick Co. and the United Brick & Tile Co. Near Choctaw, the Oklahoma Lightweight Aggregate Corp. produced clay for lightweight aggregate. Construction and paving sand was produced by two operators; other sand and gravel was produced by the State highway department.

**Okmulgee.**—Coal was mined near Henryetta by Starr Coal Co., Carbon Hill Coal Co., Ben Hur Coal Co., and McGinnis & Grafe, Inc. Petroleum and natural gas were produced from 27 fields. The Ada Stone Co. quarried sandstone near Henryetta.

**Osage.**—Osage, with 127 fields producing oil and gas, rose from 4th to 2d in rank as an oil-producing county in 1956. The Burbank field, under an extensive waterflooding program, produced 13.5 million barrels of oil and remained the most prolific. Natural-gas liquids were recovered by Phillips Petroleum Co., Skelly Oil Co., Neal Gasoline Co., and Sunray Mid-Continent Oil Corp. The county led in exploratory drilling. Out of 97 tests, 16 were oil productive, and 2 were gas productive. Limestone was quarried and crushed east of Burbank; paving sand was produced by the State highway department.

**Ottawa.**—The entire Oklahoma lead and zinc output and most of the Tri-State district output was supplied from 80 mines in Ottawa County. Chat—a byproduct of zinc and lead milling—was supplied by six producers. Tripoli was quarried in east central Ottawa County by the American Tripoli Division and processed in its plant at Seneca, Mo. Sand and gravel was produced by the State highway department.

**Pawnee.**—Petroleum and natural gas were produced from 28 fields, and natural-gas liquids were recovered by the Frame Natural Gasoline Co. Exploratory drilling proved that 34 test wells were dry. Construction sand and gravel was produced by four operators.

**Payne.**—Petroleum and natural gas were produced from 71 fields; the Yale-Quay, with a yearly production of 1.3 million barrels of oil, was the largest in the county. The gasoline plant of Sunray Mid-Continent Petroleum Corp. near Stillwater was shut down. Exploratory drilling resulted in 8 oil wells and 17 dry holes. Sand and gravel was produced by the county highway department.

**Pittsburg.**—Pittsburg County ranked second in value of coal produced. Coal was mined underground by Lone Star Steel Co. and McAlester-Alderson Coal Co. Natural gas was produced from three fields near Quinton. Sand and crushed limestone were produced for highway construction. The Oklahoma State Penitentiary west of McAlester produced clay for manufacturing of brick and tile.

**Pontotoc.**—Petroleum and natural gas were produced from 23 fields; natural-gas liquids were recovered by the Carter Oil Co. plant. Twelve exploratory wells were drilled; all proved dry. Building

Digitized by Google

limestone was quarried near Fittstown by two operators; near Lawrence the Ideal Cement Co. quarried shale and limestone for use in its plant at Ada. Molding sand was produced by Grade A Sand & Gravel Co. and Mid-Continent Glass Sand Co.; paving sand and gravel by the State highway department. At Ada, Okla., Ideal Cement Co. started erecting buildings for a new $14 million plant. Combined cement capacity of the new and old plants will be 3,650,000 barrels yearly.

**Pottawatomie.**—Petroleum and natural gas were produced from 68 fields; the St. Louis field was the largest. Natural-gas liquids were recovered by the plants of Warren Petroleum Co. and the Sinclair Oil & Gas Co. Three oil-discovery wells were completed. Sand and gravel was produced for highways.

**Rogers.**—Coal was strip-mined by the McNabb Coal Co. and Peabody Coal Co. Petroleum and natural gas were produced from three fields; the Chelsea district supplied most of the oil produced. Sand and gravel and crushed limestone were produced for highways.

**Seminole.**—Petroleum and natural gas were produced from 76 fields; the Seminole City field was the most prolific. Natural-gas liquids were recovered by the plants of Carter Oil Co., Sinclair Oil & Gas Co., and Phillips Petroleum Co. Exploratory drilling crews completed two oil wells. Clay for manufacturing brick and tile was obtained west of Wewoka by Wewoka Brick & Tile Co. Sand and gravel was produced for highways.

**Sequoyah.**—Coal was strip-mined by the Sallisaw Stripping Co. Limestone was crushed north of Marble City at the quarry of the St. Clair Lime Co. Part of the limestone that had been crushed at Marble City was burned at Sallisaw in the kilns of the St. Clair Lime Co. Dimension sandstone was quarried by Cookson Hills Stone Co. Natural gas was produced from a small field. Sand and gravel was produced for highways.

**Stephens.**—The county ranked fourth in petroleum production. Petroleum and natural gas were produced from 38 fields. Natural-gas liquids were recovered by Magnolia Petroleum Co., Comanche Gasoline Co., and Skelly Oil Co. Exploratory drilling found five oil-productive wells. West of Duncan construction started on the Patoma Hydrocarbon Co. new plant, which will process natural gas and propane fuels. Sand and gravel was produced for highways.

**Texas.**—Natural gas, from the vast Hugoton gas field, and petroleum were produced during the year. Natural-gas liquids were recovered in the vicinity of Guymon by Cities Service Oil Co. and Hugoton Plains Gas & Oil Co. Five oil wells and two gas wells were completed as a result of exploratory drilling. Construction sand and gravel was produced north and south of Guymon by the Stewart Bros. and for highways by the State highway department.

**Tulsa.**—Petroleum and natural gas were produced from 23 fields, and natural-gas liquids were recovered by the plant of Pioneer Corp. near Bixby. In Tulsa, brick and tile were manufactured by the Acme Brick Co. and the United Brick & Tile Co.; in Collinsville, by the United Brick & Tile Co. East of Tulsa, near Garnett, crushed limestone was produced by the Anchor Stone Co., and the Chandler Materials Co.; elsewhere by Standard Industries, Inc. Construction

Digitized by Google

sand was produced by nine operators for paving by the State highway department.

**Washington.**—Petroleum and natural gas were produced from five districts. Limestone and clay were quarried near Dewey for the manufacture of portland cement by the Dewey Portland Cement Co. Part of the limestone quarried at Dewey was marketed as crushed limestone. Crushed limestone also was produced near Bartlesville by the Matoaka Stone Co. The Research Center of Phillips Petroleum Co. was under construction at Bartlesville during the year.

**Washita.**—Petroleum and natural gas were produced from 3 small fields and from part of the important Elk City field. Sand and gravel was produced for highways.

**Woods.**—Construction sand and gravel was produced near Waynoka by the Waynoka Sand & Gravel Co. Salt was produced west of Freedom by Ezra Blackmon. Petroleum and natural gas were produced from 1 field, and exploratory drilling proved 1 oil and 2 gas wells.

Digitized by Google

# The Mineral Industry of Oregon

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Oregon State Department of Geology and Mineral Industries.

By Kenneth D. Baber,[1] Frank B. Fulkerson,[1] Norman S. Petersen,[1] and Albert J. Kauffman, Jr.[2]

OREGON'S mineral production increased 7 percent in 1956 and was valued at more than $34 million—a new record for the State. Increased output of metallic ores, with nickel, chromite, and mercury registering major gains, and increased production of cement more than offset a decline in the volume of sand-and-gravel and stone. Nickel-ore output was increased to meet smelter requirements. The gain in chromite production was due primarily to output from an operation in Coos County, whereas the gain in mercury production was due to a comparatively stable high price. A cement shortage was alleviated through installation of new capacity, and further expansion in production of this commodity was expected. The decline in sand-and-gravel and stone production was due to decreased output by contractors for the United States Army Corps of Engineers at The Dalles Dam on the Columbia River and by contractors for the State highway commission.

**Trends and Markets.**—Concrete pouring at The Dalles Dam was virtually completed in 1956, and riprap work was to be finished in 1957. Most of the cement used at the project was imported from other States. A drop of 15 percent in tonnage of upriver barge traffic from Portland was due primarily to a decline in cement shipments to The Dalles.

An expanded highway program in the State was assured through passage of the Federal Highway Act of 1956. Oregon planned to spend $650 million by 1970 for modernization of Federal-aid primary and secondary roads and more than $140 million by 1962 on two Oregon highways included in the interstate system. The Columbia River Highway (U. S. 30) was to be made a 4-lane divided highway from Portland to Ontario, and the Pacific Highway (U. S. 99) was to be made a 4-lane throughway from Portland to the southern border of the State. The National Crushed Stone Association estimated sand and gravel, crushed stone, and other aggregate needed for the new highway system in Oregon, in addition to normal requirements, as follows: 1957, 3.6 million tons; 1958, 3.7 million tons; and 1959, 4.1 million tons.[3]

[1] Commodity-industry analyst, Division of Mineral Industries, Region I, Bureau of Mines, Albany, Oreg.
[2] Chief, Division of Mineral Industries, Region I, Bureau of Mines, Albany, Oreg.
[3] Rock Products, vol. 60, No. 1, January 1957, pp. 78–79.



Digitized by Google

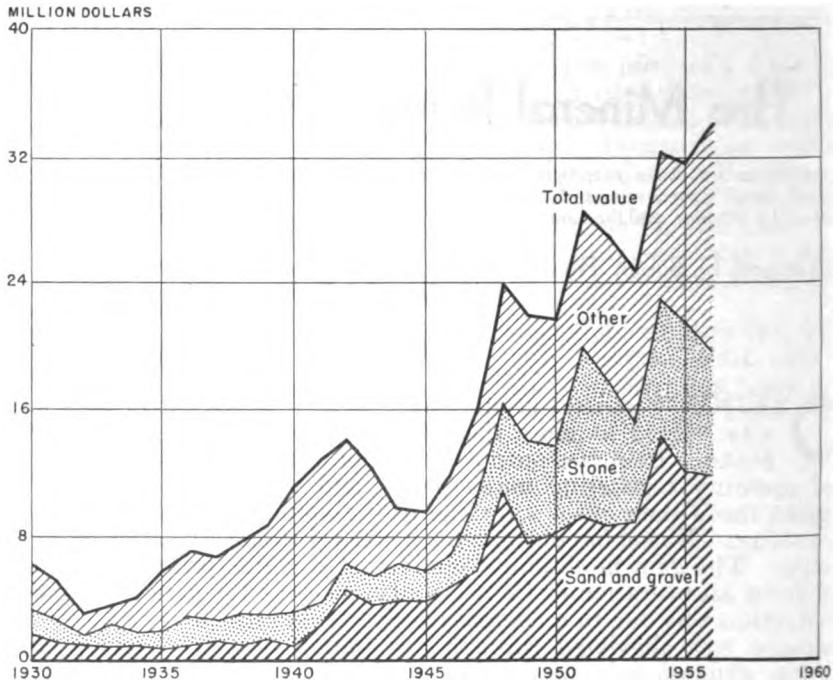



FIGURE 1.—Value of sand and gravel, stone, and total value of mineral production in Oregon, 1930–56.

**TABLE 1.—Mineral production in Oregon, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Chromium ore and concentrate.....gross weight.. | 5,341 | $463,514 | [2] 54,577 | [2] $2,001,063 |
| Clays | 250,608 | 275,916 | 256,942 | 278,205 |
| Copper (recoverable content of ores, etc.) | 4 | 2,984 | 7 | 5,950 |
| Gold (recoverable content of ores, etc.)....troy ounces.. | 1,708 | 59,780 | 2,738 | 95,830 |
| Iron ore (limonite).....long tons.. | 1,786 | (3) | 893 | (3) |
| Lead (recoverable content of ores, etc.) | 3 | 894 | 5 | 1,570 |
| Mercury.....76-pound flasks.. | 1,056 | 306,610 | 1,893 | 492,029 |
| Nickel ore.....nickel content.. | 4,181 | (3) | 6,866 | (3) |
| Sand and gravel | 11,953,878 | 11,832,344 | 11,637,183 | 11,646,367 |
| Silver (recoverable content of ores, etc.)...troy ounces.. | 8,815 | 7,978 | 13,542 | 12,256 |
| Stone | 7,741,937 | 9,417,834 | 6,097,965 | 7,890,197 |
| Tungsten ore and concentrate...60-percent $WO_3$ basis.. | 1 | (3) | (3) | (3) |
| Value of items that cannot be disclosed: Carbon dioxide, cement, coal (1955), diatomite, gem stones, iron-oxide pigments (1956), pumice, and values indicated by footnote 3 | | 10,500,091 | | 12,929,235 |
| Total Oregon [4] | | 31,736,000 | | 34,011,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Includes 45,710 short tons of concentrate produced in 1955 and 1956 from low-grade ore and concentrate stockpiled near Coquille, Oreg., during World War II.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Total adjusted to eliminate duplicating value of clays and stone.

Digitized by Google

Continued expansion in primary metals contrasted with a recession in logging and lumbering, by far Oregon's principal manufacturing industry. One of the largest heavy-construction projects in the State was the Harvey Aluminum Co. $65-million smelter at The Dalles. The plant, with a capacity of more than 100 million pounds of aluminum annually, was to be completed in 1958. Electric energy was to be made available to the facility by the generators of the new The Dalles Dam through the network of the Bonneville Power Administration (BPA). Full production was reached at the Hanna Nickel Smelting Co. plant near Riddle after installation of the last 2 of 4 furnaces. Near Albany, Oregon Metallurgical Corp. initiated a titanium- and zirconium-sponge melting operation in 1956, and Wah Chang Corp. began constructing a metallurgical plant for production of zirconium.

Although production by the Pacific Northwest aluminum industry reached a record total in 1956, owing to expansion of established plants and completion of a new plant at Columbia Falls, Mont., further rapid growth may be limited by the availability of electric power. The smelter at The Dalles was the only aluminum plant scheduled for construction in the region. In 1956 the relative position of the aluminum industry in the Pacific Northwest compared with the United States as a whole was improved temporarily. However, planned construction in 1957 of three plants in the Ohio River Valley would tend further to diminish production in the Pacific Northwest compared with the total United States output. The Ohio River Valley plants were to use steam generated from coal for power.

A report published in 1957 itemized 45 chemicals and nonmetallic minerals, such as lime, limestone, sulfur, sulfuric acid, and chlorine, used in the Pacific Northwest pulp and paper industry in 1956.[4] The report gave information as to tonnages and percentages obtained from the northwestern, western, central, and eastern areas of the United States and from foreign sources.

There were two outstanding developments in the mineral-fuels industry in 1956. The first was completion of the natural-gas pipeline to the Pacific Northwest from the San Juan field in New Mexico. It was expected that the natural gas would be used extensively in the mineral industries, particularly at plants where heat was a high cost factor, such as those producing cement, lime, glass, ceramics, and primary metals. It was also expected that natural gas would be used in the production of industrial chemicals and fertilizers. Previously gas had been manufactured at Portland and had been used primarily for space heating of homes and businesses; the gas had found no heavy industrial use owing to its comparatively high cost. The Portland plant of Owens-Illinois, which began producing in the summer of 1956, was the first industrial establishment to employ natural gas. It was also the first glass plant in Oregon and the second in the Pacific Northwest. Because of high heat requirements, the melting furnaces of the new plant burned natural gas at a rate equivalent to the average

[4] Guthrie, Frank K., and others, The 1956 Chemical Requirements for the Pacific Northwest Pulp and Paper Industry: Raw Materials Survey, Portland, Oreg., March 1957, 10 pp.

Digitized by Google

annual consumption of 2,000 homes. Raw materials, including sand, soda ash, and limestone, were obtained from out-of-State sources. The new high-grade industrial lime plant of Chemical Lime Co. at Baker also was to use natural gas in firing the kilns. Capacity of the Pacific Northwest pipeline system was to be doubled in 1957 by completion of a pipeline from the Peace River field in Canada.

The second development in the mineral-fuels industry was the announcement by the Pacific Power & Light Co. of plans for extensive exploration of the Eden Ridge coal field in Coos County as a source of energy for a proposed 100,000-kw. steam-electric plant.

**Employment and Wages.**—Employment in mining industries covered by the Unemployment Compensation law averaged 1,260—280 in metal mining and 980 in nonmetallic-mineral mining. These figures did not represent the total number of persons engaged in mining, because small establishments hiring less than 2 workers (less than 4 workers before 1956) were exempt from coverage, as were self-employed persons and State and county agencies. In addition, some mining and quarrying were part of another major activity, such as road construction. With extension of the Unemployment-Compensation law to all plants hiring two or more workers, the data on covered employment in mineral manufacturing, approximated the total employment. Mineral manufacturing employed 6,940 workers in 1956—67 percent in primary-metals plants; 22 percent in making stone, clay, and glass products; and the remainder mainly at plants manufacturing products of petroleum, coal, and industrial chemicals. Employment increased 13 percent compared with 1955 and 21 percent compared with 1950. Virtually all of the expansion resulted from growth in the primary-metals industries in 1955 and 1956. Total employment in other mineral manufacturing remained about the same in 1956 as in the preceding 5 years. Payrolls of employers subject to the Unemployment-Compensation law were $6.2 million in mining and $36.5 million in mineral manufacturing—a total annual payroll in the mineral industries of $42.7 million in 1956.

**Hours and Earnings.**—Average hourly earnings for production workers (excluding supervisory and administrative personnel) in the primary-metals industry rose to a peak of $2.44 in 1956, according to data tabulated by the Oregon State Unemployment Compensation Commission on the basis of reports from representative employers. The average workweek was 40.1 hours in 1956, and average weekly earnings advanced to $97.64. The hours and earnings figures included premium pay for night-shift and overtime work. Average weekly earnings in the primary-metals industry increased to $101.89 in December, owing to higher hourly rates and a longer workweek.

**Defense Minerals Exploration Administration.**—The Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences.

Digitized by Google

**TABLE 2.—Employment and payrolls in mineral-industry establishments subject to Oregon Unemployment-Compensation law, 1952–56, by industry [1]**

| Industry | 1952 | | 1953 | | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Employment | Payrolls | Employment | Payrolls | Employment | Payrolls | Employment | Payrolls | Employment | Payrolls |
| Mining: | | | | | | | | | | |
| Metal | 130 | $492,475 | 125 | $475,802 | 143 | $607,140 | 201 | $955,584 | 279 | $1,378,443 |
| Nonmetallic, including mineral fuels | 1,046 | 4,506,989 | 1,077 | 4,831,919 | 1,039 | 4,696,891 | 987 | 4,603,607 | 980 | 4,849,906 |
| Total mining | 1,176 | 4,999,464 | 1,202 | 5,307,721 | 1,182 | 5,304,031 | 1,188 | 5,559,191 | 1,259 | 6,228,349 |
| Mineral manufacturing: Stone, clay, and glass products: | | | | | | | | | | |
| Glass and pottery | 59 | 195,907 | 56 | 186,308 | 54 | 178,794 | 48 | 173,077 | 156 | 770,311 |
| Hydraulic cement | 462 | 1,949,424 | 455 | 2,052,879 | 466 | 2,119,640 | 450 | 2,107,650 | 453 | 2,337,194 |
| Structural clay products | 251 | 1,042,698 | 253 | 1,050,849 | 250 | 1,073,040 | 247 | 1,093,699 | 246 | 1,144,621 |
| Concrete, gypsum, and plaster products | 442 | 1,709,639 | 407 | 1,708,427 | 366 | 1,593,346 | 399 | 1,812,993 | 486 | 2,264,483 |
| Cut-stone and stone products | 50 | 177,137 | 56 | 225,568 | 58 | 242,123 | 51 | 218,574 | 51 | 233,342 |
| Miscellaneous nonmetallic mineral products | 90 | 319,699 | 83 | 311,664 | 81 | 316,228 | 73 | 306,812 | 77 | 338,154 |
| Total | 1,354 | 5,394,504 | 1,310 | 5,535,695 | 1,275 | 5,523,171 | 1,268 | 5,712,805 | 1,469 | 7,088,105 |
| Primary-metals: | | | | | | | | | | |
| Blast furnaces, steel works, and rolling mills; and primary and secondary smelting and refining of nonferrous metals | 1,320 | 6,483,418 | 1,330 | 7,015,985 | 1,490 | 7,874,545 | 1,940 | 10,758,698 | 2,226 | 12,893,260 |
| Iron and steel foundries | 1,598 | 7,195,384 | 1,597 | 7,592,262 | 1,466 | 7,141,997 | 1,695 | 8,656,818 | 1,976 | 10,435,438 |
| Nonferrous foundries | 265 | 1,025,949 | 275 | 1,116,556 | 243 | 1,011,278 | 254 | 1,107,750 | 333 | 1,522,009 |
| Miscellaneous primary metal industries | 232 | 1,069,202 | 151 | 681,334 | 129 | 606,043 | 169 | 817,852 | 125 | 636,508 |
| Total | 3,415 | 15,773,953 | 3,353 | 16,406,137 | 3,328 | 16,633,863 | 4,058 | 21,341,118 | 4,660 | 25,487,215 |
| Industrial organic and inorganic chemicals | 478 | 2,021,909 | 634 | 2,624,381 | 507 | 2,296,151 | 326 | 1,514,980 | 334 | 1,605,525 |
| Fertilizers | 108 | 451,263 | 47 | 215,559 | 49 | 223,878 | 48 | 233,904 | 61 | 248,010 |
| Products of petroleum and coal | 368 | 1,679,532 | 369 | 1,702,677 | 406 | 1,914,165 | 432 | 2,035,638 | 418 | 2,086,474 |
| Total mineral manufacturing | 5,723 | 25,321,161 | 5,713 | 26,484,449 | 5,565 | 26,591,228 | 6,132 | 30,838,445 | 6,942 | 36,515,329 |
| Grand total | 6,899 | 30,320,625 | 6,915 | 31,792,170 | 6,747 | 31,895,259 | 7,320 | 36,397,636 | 8,201 | 42,743,678 |

[1] Oregon State Unemployment Compensation Commission. Figures were limited to data reported by employers subject to Oregon Unemployment-Compensation law, under the provisions requiring coverage of employers hiring 2 or more workers (4 or more workers before 1956) in any 6 weeks in a quarter in which the payroll amounted to $500 or more. Some industries were combined in the table because there were less than 3 employers.

Digitized by Google

**TABLE 3.—Defense Minerals Exploration Administration contracts active in 1956**

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total amount | Government participation, percent |
| LANE | | | | | |
| Mercury & Chemicals Corp... | Black Butte..... | Mercury.... | Aug. 22, 1956 | $62,340 | 75 |
| MALHEUR | | | | | |
| H. K. Riddle..... | Jordan..... | .....do..... | May 28, 1956 | 31,000 | 75 |

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Cement.**—Production and shipments of portland cement continued the upward trend and increased 14 and 12 percent, respectively, over 1955. End-of-the-year stocks of portland cement were considerably higher than at the end of 1955. An increase in price was reported by most companies producing portland cement. The increase was in line with the upward trend of cement prices nationally, as announced in January by many major cement-producing companies. The average price for cement shipped by producers in Oregon was about 25 cents a barrel above the 1955 average. Companies producing portland cement in 1956 were Oregon Portland Cement Co. (with plants at Lime, Baker County, and Oswego, Clackamas County) and Pacific Division, Ideal Cement Co. (at Gold Hill, Jackson County).

Oregon Portland Cement Co. began constructing a new kiln to double the capacity of its plant at Lime. The increase in capacity was needed to meet cement requirements for hydroelectric construction projects in the area. The company also began operating a new kiln at its Oswego plant in 1956; construction of the kiln was part of a general expansion and modernization program begun in 1955.

Oregon cement output was shipped chiefly to consumers within the State, but some portland cement was shipped to neighboring States—Washington, Idaho, and California.

**Clays.**—The quantity and value of clays produced in 1956 were slightly higher than in 1955. Tonnage of clays used in heavy clay products increased, whereas the quantities of shale used for making lightweight aggregate and clays and shale used in the cement were slightly under 1955. Most of the clays mined in the State were used in building brick and tile, draintile, and sewer pipe. Two companies mined shale in Washington County for processing into lightweight aggregate. Northwest Aggregates, Inc., operated a pit and expanding plant near Banks, and Smithwick Concrete Products Co. operated the Vernonia pit near Buxton. The latter company shipped the shale to its Portland plant for expanding into lightweight aggregate.

Clays for all uses were produced from 24 operations in 15 counties; 19 of them supplied clays for building brick and other heavy clay products. Washington County, with two shale producers, ranked

Digitized by Google

first in clay output in the State; however, Multnomah County ranked first in the quantity of clays mined for heavy clay products. Other counties reporting output were Baker, Benton, Clackamas, Jackson, Josephine, Klamath, Linn, Malheur, Marion, Polk, Tillamook, Union, and Yamhill.

Clays obtained from Lincoln, Placer County, Calif., supplemented local clays at one plant in southern Oregon.

The development of the ceramic industry and raw material resources of Oregon were discussed in a Bureau of Mines report.[5]

**Diatomite.**—Great Lakes Carbon Corp., Dicalite Division, continued producing and preparing diatomite (diatomaceous earth) from its open pit west of Terrebonne, Deschutes County. The company reported a decline in demand in 1956, which resulted in reduced output compared with 1955. This was the third consecutive year in which diatomite production declined in Oregon. Despite the smaller output, Oregon remained the third-ranking State in production of diatomite in 1956; California was the leading producer in the Nation, and Nevada ranked second. The prepared product was marketed for filtration, filler, insulation, and other miscellaneous uses. The company was active in exploring diatomite deposits in the Otis Basin area of Harney County in 1956.

**Gem Stones.**—Gem stones include precious and semiprecious stones suitable for cutting and polishing for use as jewelry and decorative stones for private collections and for a variety of ornamental purposes. Semiprecious gems were the only type recovered in Oregon.

Gems were collected in 1956, as in 1955, largely by hobbyists, vacationers, and out-of-State collectors. No gem-stone mines were active in the State, but areas of central Oregon and the coastal beaches were sources of a large quantity of crude gem stones. Agate, petrified wood, obsidian, and thunder eggs were reported most frequently by collectors in 1956. Central Oregon was the most active area; in Jefferson, Crook, and Morrow Counties a fee was charged for digging or obtaining gem stones.

No revolutionary new techniques were introduced in 1956 for finishing or polishing gem stones, but the tumbling method developed in recent years continued to expand in scope. The costume-jewelry-manufacturing industry was the largest consumer of low-cost polished gems. Hundreds of individuals produced and sold agate dug or collected within the State. Some stones were sold in local gem and agate shops, and some were sold crude to buyers throughout the United States.

**Iron Oxide Pigment.**—Crude iron oxide pigment was produced by C. K. Williams & Co. from a deposit near Scappoose (Columbia County). The mineral pigment was shipped to out-of-State consumers for use in paints. The operation was idle in 1955. Orr Engineering & Chemical Co. reported production of a small quantity of manufactured iron oxide pigments. The raw material—limonite—was obtained from a pit, also near Scappoose.

**Lime.**—Chemical Lime Co. continued constructing a two-kiln limeplant northwest of Baker (Baker County). The plant, designed

[5] Kelly, H. J., Strandberg, K. G., and Mueller, J. I., Ceramic Industry Development and Raw-Material Resources of Oregon, Washington, Idaho, and Montana: Bureau of Mines Inf. Circ. 7752, 1956, 77 pp.

Digitized by Google

to produce chemical and hydrated lime for use by the carbide, metallurgical, sugar, and paper industries in the Pacific Northwest, was scheduled for completion about mid-1957. Natural gas, which became available during the year, was to be used for firing the kilns.

**Natural Salines.**—A. M. Matlock of Eugene produced a small quantity of sodium carbonate in 1956. The crystallized salt was produced from potholes in Alkali Lake (Lake County). The operator reported that demand was increasing and that larger output was expected in 1957.

**Perlite.**—Supreme Perlite Co. processed crude perlite to the expanded product at its plant at North Portland (Multnomah County). The expanded perlite was marketed chiefly as a plaster aggregate, with minor quantities for foundry, horticultural, and concrete-aggregate uses. Production from the plant decreased compared with 1955. Raises in wages and railway-transportation rates increased operating costs in 1956.

No production of crude perlite was reported in Oregon in 1956. The last output was recorded in 1953 from an operation near Freida (Wasco County).

**Pumice.**—Production of crude and prepared pumice was substantially the same as in 1955. The 1955 output was the largest since 1949, when 104,475 tons was produced. In 1955 Oregon ranked third in the Nation in tonnage output of pumice. Central Oregon Pumice Co. and Lloyd A. Williamson, both with operations near Bend (Deschutes County), produced and prepared pumice for concrete aggregate. Harney Concrete Tile Co., Burns (Harney County), produced both crude and prepared pumice. The Deschutes Concrete Products Co. near Tumalo (Deschutes County) was inactive in 1956. The Cinder Hill Co. of Redmond produced cinders for road and ballast use from operations in Crook County. Pumice-producing companies reported that new and improved methods of processing instituted during 1956 resulted in a uniform product of higher quality.

An article published in 1956 discussed pumice and the pumice industry in Oregon.[6]

**Sand and Gravel.**—Output of sand and gravel was reported from a wide variety of operations throughout the State. In tonnage and value, sand and gravel was again the most important mineral commodity produced in Oregon in 1956. Sand and gravel, often considered a plentiful commodity of relatively low value, nevertheless is one of the most important products of the mineral industry.

A gross output of 11.6 million tons of sand and gravel valued at $11.6 million in 1956 represented a 3-percent decrease from the 1955 production—11.9 million tons valued at $11.8 million. Commercial producers supplied 8.2 million tons valued at $8.4 million in 1956, compared with 6.8 million tons valued at $7.4 million in 1955. Government-and-contractor production was 3.4 million tons valued at $3.2 million in 1956 compared with 5.1 million tons valued at $4.4 million in 1955.

The largest single user of sand and gravel in the State was the Oregon State Highway Department, which reported a decrease in the quantity used for road building and maintenance in 1956. Other

[6] Mason, R. S., New Products from Old Volcanoes: Oregon State Dept. of Geol. and Min. Ind., The Ore.-Bin, vol. 18, No. 11, November 1956, pp. 93–97.

Digitized by Google

large users were the United States Army Corps of Engineers and county and municipal road departments.

**TABLE 4.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | | Percent of change in | |
|---|---|---|---|---|---|---|---|---|
| | | Value | | | Value | | | |
| | Short tons | Total | Average per ton | Short tons | Total | Average per ton | Tonnage | Average value |
| COMMERCIAL OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 2,883,875 | $3,284,641 | $1.14 | 3,256,879 | $3,418,622 | $1.05 | +13 | −8 |
| Road material | 3,201,154 | 3,512,627 | 1.10 | 4,109,715 | 4,351,838 | 1.06 | +28 | −4 |
| Railroad ballast (gravel) | 176,814 | 160,415 | .91 | 177,284 | 194,504 | 1.10 | 0 | +21 |
| Other [1] | 597,588 | 473,785 | .79 | 635,121 | 461,626 | .73 | +6 | −8 |
| Total sand and gravel | 6,859,431 | 7,431,468 | 1.08 | 8,178,999 | 8,426,590 | 1.03 | +19 | −5 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 168,993 | 95,780 | .57 | 138,713 | 119,447 | .86 | −18 | +51 |
| Road material | 4,925,454 | 4,305,096 | .87 | 3,319,471 | 3,100,330 | .93 | −33 | +7 |
| Total sand and gravel | 5,094,447 | 4,400,876 | .86 | 3,458,184 | 3,219,777 | .93 | −32 | +8 |
| TOTAL ALL OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 3,052,868 | 3,380,421 | 1.11 | 3,395,592 | 3,538,069 | 1.04 | +11 | −6 |
| Road material | 8,126,608 | 7,817,723 | .96 | 7,429,186 | 7,452,168 | 1.00 | −9 | +4 |
| Railroad ballast (gravel) | 176,814 | 160,415 | .91 | 177,284 | 194,504 | 1.10 | 0 | +21 |
| Other | 597,588 | 473,785 | .79 | 635,121 | 461,626 | .73 | +6 | −8 |
| Grand total | 11,953,878 | 11,832,344 | .99 | 11,637,183 | 11,646,367 | 1.00 | −3 | +1 |

[1] Includes molding, engine, and ballast sands and sand and gravel used for miscellaneous unspecified purposes.

Of the total output of 11.6 million tons of sand and gravel in Oregon in 1956, 64 percent was used for road building and maintenance, 29 percent for building and construction projects, and the remaining 7 percent for miscellaneous applications, including railroad ballast and special sands.

Output was reported from 31 of the 36 counties in the State. Sand and gravel production from operations in Clackamas, Multnomah, and Lane Counties, totaled more than 5 million tons, amounting to over 40 percent of the sand and gravel produced in Oregon in 1956.

**Stone.**—Gross output of 6.1 million tons of stone valued at $7.9 million was reported in 1956—a drop of 21 percent in output and 16 percent in value from 1955. Decreased consumption by the Oregon State Highway Department was the principal cause for the large decline. Commercial production was 3.3 million tons valued at $4.7 million and Government-and-contractor output 2.8 million tons valued at $3.2 million. Comparable figures for 1955 were commercial output, 3.3 million tons ($4.3 million); and Government-and-contractor, 4.4 million tons ($5.1 million). About 69 percent of the total output was used for constructing and maintaining roads.

Digitized by Google

**TABLE 5.—Stone sold or used by producers, 1955–56, by uses**

| | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Building (dimension stone) | (1) | (1) | (1) | (1) |
| Concrete, roadstone, and screening | 6,117,702 | $6,991,936 | 4,205,073 | $5,193,947 |
| Riprap | 246,082 | 221,465 | 685,571 | 574,005 |
| Railroad ballast | 540,059 | 565,415 | (1) | (1) |
| Other [2] | 838,094 | 1,639,018 | 1,207,321 | 2,122,245 |
| Total | 7,741,937 | 9,417,834 | 6,097,965 | 7,890,197 |

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Used at sugar refineries, in manufacturing paper and cement, in metallurgical and chemical plants, and for other unspecified uses.

Output of crushed limestone in 1956 totaled 960,000 tons—a 17-percent increase over the 821,000 tons recorded in 1955. Oregon Portland Cement Co. quarried limestone for use in the manufacture of cement from operations in Baker and Polk Counties, and Ideal Cement Co., Pacific Division, obtained limestone from its Marble Mountain quarry in Josephine County. National Industrial Products Corp., Durkee, Baker County, also crushed limestone for use in cement manufacture. Production of crushed limestone was recorded from Baker, Douglas, Josephine, Polk, and Wallowa Counties. The largest single consumer of crushed limestone in 1956 was the cement industry. Other consumers, in order of quantity used, were sugar refineries; paper, calcium carbide, and metallurgical plants; and agricultural users.

Northwestern Granite Co. quarried granite monumental stone from its Haines quarry (Baker County). Production remained substantially the same as in 1955. Bristol Silica Co. produced crushed granite for use as chicken grit from its quarry and crushing plant near Rogue River (Jackson County).

Tuff was quarried and split to building stone by the Rainbow Rock Co. at its quarry and plant near Maupin (Wasco County). The stone, used principally as a decorative building stone, was marketed as "rainbow rock," so named because of the various shades of red, pink, and brown. The company reported that demand for the stone was good throughout the year, but increased transportation rates resulted in price adjustments. Tuff also was quarried for building stone by the Oregon Tuff Stone Co. at its quarry near Sublimity (Marion County). Bristol Silica Co. continued operating a quarry near Rogue River (Jackson County) and produced crushed quartz for industrial uses; production increased over 1955.

Output of stone was reported from 34 of the 36 counties in Oregon.

**Talc and Soapstone.**—Soapstone mined in Skagit County, Wash., was ground by Stauffer Chemical Co. and Miller Products Co., both in Portland (Multnomah County). The ground product was used as a filler material in the manufacture of insecticides. Total production was lower than in 1955.

**Vermiculite.**—Vermiculite-Northwest, Inc., exfoliated vermiculite at its plant in Portland (Multnomah County); output was less than in 1955. Crude vermiculite came from Montana, and the expanded product was marketed throughout the Pacific Northwest for use as

Digitized by Google

insulation and concrete and plastera ggregate. The decrease in residential construction in the area in 1956 largely explained the decline in output.

## METALS

**Aluminum.**—Harvey Aluminum Co., under a Government expansion-goal contract and a power contract with the Bonneville Power Administration (BPA), both signed in 1955, began work on facilities for a $65-million, 108-million-pound-annual-capacity, primary-aluminum-reduction plant at The Dalles in February. Owing to unavoidable delays in delivery dates for electrical equipment on order, the May 1 deadline for beginning plant construction was extended 90 days. The expansion-goal contract called for production of 270,000 tons of aluminum by June 30, 1963, and the 20-year BPA contract called for providing 40,000 kw. of firm power and 80,000 kw. of interruptible power yearly. Arrangements for obtaining alumina—the basic raw material consumed in an aluminum-reduction plant—were made public. Over 100,000 tons of alumina was to be provided annually by 2 Japanese companies, Nippon Light Metal Co., Ltd., and Sumitomo Chemical Co., Ltd. Alumina would be carried up the Columbia River to The Dalles from the ports of Niihama and Shimizu, Japan, by ocean-going barges.

The Reynolds Metals Co. continued to operate its aluminum reduction plant at Troutdale on the Columbia River 15 miles east of Portland. About 950 persons were employed. The company also was engaged in a $900,000 program to increase plant capacity 8 million pounds annually. Output at the plant was threatened with curtailment in the latter part of the year when less-than-average rainfall in the Northwest failed to replenish reservoirs from which water was drawn for hydroelectric power.

The Oregon State Department of Geology and Mineral Industries conducted detailed examinations on lateritic deposits in Marion County from 1953 to 1955.[7] During drilling and sampling, more than 250 samples were analyzed chemically in conjunction with spectrographic, petrographic, and X-ray diffraction studies. A report published in 1956 traced briefly the development of the Pacific Northwest aluminum industry and provided data on production, plant capacities, and employment.[8] In 1955, the Northwest primary-aluminum industry paid $3 million in taxes; obtained $24.2 million worth of materials, supplies, and services within the region; purchased electric power amounting to $20.5 million; had a payroll of $54.1 million; and employed 10,500 persons. In a subsequent newsletter,[9] employment in the Northwest primary-aluminum industry in 1956 was reported to be 11,400, with wages totaling $63.9 million. About 46 percent of the aluminum output was processed further by the producing companies into finished and semifinished forms, such as sheet, rod, wire, cable, and extrusions. The value of electric power purchased in 1956 totaled $22.8 million.

**Chromium.**—Output of chromite ores and concentrates rose sharply in 1956, owing primarily to inclusion in State totals of con-

[7] Corcoran, R. E., and Libbey, F. W., Ferruginous Bauxite Deposits in the Salem Hills, Marion County Oreg.: Oregon State Dept. of Geol. and Min. Ind., Bull. 46, 1956, 53 pp.
[8] Sterrett, Chester K., Aluminum Fabrication in the Pacific Northwest: Raw Materials Survey, Inf. Circ. 10, August 1956, 5 pp.
[9] Raw Materials Survey Newsletter, Issue 1, Series 57, Mar. 29, 1957.

Digitized by Google

centrate produced by Pacific Northwest Alloys, Inc., at Coquille (Coos County). The company completed operations in the summer of 1956. The concentrate, totaling 45,710 short tons, was produced in 1955 and 1956 under Government contract from low-grade concentrate resulting from mining chromite-bearing black-sand deposits on the Oregon coast during World War II. The low-grade material, averaging about 25 percent $Cr_2O_3$, yielded a concentrate containing a little more than 40 percent $Cr_2O_3$ with a chromium to iron ratio of 1.3–1.5 : 1. The product was shipped to the company plant at Mead, Wash., for conversion into ferrochromium. A smaller quantity of concentrate, stockpiled separately and containing about 39 percent $Cr_2O_3$, was shipped direct to the Mead plant without further concentration. This high-grade material was reported as mineral production in 1943. In that year, Humphreys Gold Corp. and Krome Corp. processed about 500,000 tons of sand and produced 87,840 short tons of concentrate averaging about 25 percent $Cr_2O_3$ which was shipped to a secondary processing plant built by the Defense Plant Corp. and operated for the Government by Southwestern Engineering Co. These operations were terminated in December 1943 because of the availability of higher grade foreign chromite.

**TABLE 6.—Shipments of chromium ore and concentrate in 1956**

| County | Number of operations reported | Value | | Short tons, gross weight | | |
|---|---|---|---|---|---|---|
| | | 1955 | 1956 | 45 percent or more $Cr_2O_3$ | Less than 45 percent $Cr_2O_3$ | Total |
| Coos | 2 | ---------- | (1) | 26 | 45,725 | 45,751 |
| Curry | 5 | $99,487 | $95,111 | 1,007 | 42 | 1,049 |
| Douglas | 2 | 9,758 | (1) | (1) | (1) | (1) |
| Grant | 10 | 64,601 | 164,671 | 1,736 | 169 | 1,905 |
| Jackson | 3 | (1) | 2,776 | 24 | 15 | 39 |
| Josephine | 16 | 278,118 | 506,926 | 4,089 | 1,697 | 5,786 |
| Malheur | 1 | ---------- | (1) | (1) | ---------- | (1) |
| Unassigned [2] | ---------- | 11,550 | 1,231,599 | 26 | 21 | 47 |
| Total | 39 | 463,514 | 2,001,083 | 6,908 | 47,669 | 54,577 |

[1] Included with "Unassigned" to avoid disclosing individual company confidential data.
[2] In 1955 includes operations for which county location was not determined.

Receipts of chromite ore and concentrate (newly mined) at the Government (GSA) Grants Pass (Oreg.) Chromite Purchase Depot also were substantially greater in 1956. The total for Oregon of 8,867 short wet tons represented a 66-percent increase over 1955. A factor in the higher output was revision of the chromite purchase regulations to extend the final date for delivery of material to the stockpile from June 30, 1957, to June 30, 1959. The revised regulations also provided for shipment of ore and concentrate on a carlot basis to points designated by the Government other than the Grants Pass Depot.

Despite the increase in newly mined output, the number of operations decreased from 47 in 1955 to 38 in 1956. As in preceding years, a large part of this production came from Josephine County. Curry and Grant Counties were the other major sources; the yield from Grant County was more than three times that in 1955. The Oregon Chrome

Digitized by Google

mine of Wm. S. Robertson was by far the principal producer of new chromite within the State; other major producing mines were Sourdough (Howard Beasley) and McCaleb (McCaleb & Kaiser), Curry County, and Haggard-New (Comstock Uranium-Tungsten Co., Inc.) and Ward and Zero (Wm. Gardner), Grant County.

Chromite production in Oregon has resulted directly from premium prices paid by the Government during periods of international tension. Output of the strategic mineral was first recorded in 1916, when nearly 3,500 short tons was produced. In 1918, which had the highest output before 1956, the yield was over 20,000 tons; however, production declined rapidly after World War I, and no significant quantities were produced until World War II and the Korean War. Through 1956, production totaled about 152,000 short tons of chromite ore and concentrate valued at approximately $6.3 million.

The Bureau of Mines conducted a study of chromite in the John Day area (Grant County).[10]

**Copper.**—Oregon's small output of recoverable copper (7 short tons valued at $5,950) was slightly higher than in 1955. Virtually the entire production came from copper and gold ores. Massive chalcopyrite extracted from the reactivated Fall Creek mine (Josephine County) provided the bulk of the metal output. J. W. Pressler operated the mine in the winter of 1955–56; ore was hauled to the Tacoma smelter. Copper also was recovered as a byproduct of gold ore mined at the Boaz Mining Co. Buffalo mine (Grant County), and small quantities were recovered from ore mined in Baker and Douglas Counties.

**TABLE 7.—Mine production of gold and silver in 1956, by months, in fine ounces of recoverable metals**

| Month | Gold | Silver | Month | Gold | Silver |
|---|---|---|---|---|---|
| January | 50 | 20 | August | 40 | 35 |
| February | 5 | | September | 310 | 2,985 |
| March | 20 | 5 | October | 224 | 224 |
| April | | | November | 655 | 2,441 |
| May | 280 | 1,600 | December | 59 | 17 |
| June | 635 | 4,065 | | | |
| July | 460 | 2,150 | Total | 2,738 | 13,542 |

A preliminary study of the Takilma-Waldo copper district was summarized in a Bureau of Mines report.[11] Surface samples were analyzed by spectrographic and chemical methods; analytical results, when plotted on a map, indicated 7 anomalies—3 in previously unexplored areas. Test drilling of an anomaly over the Queen of Bronze workings indicated that much of the anomalous mineralization is surficial and possibly the result of ground-water movement.

**Ferroalloys.**—Output of ferromanganese, ferrosilicon, and calcium carbide continued in 1956 at the Portland plant of Electro Metallurgical Co., a division of Union Carbide & Carbon Corp. Operations at the plant, begun by the company in July 1942, averaged 84

[10] Hundhausen, R. J., Banning, L. H., Harris, H. M., and Kelly, H. J., Exploration and Utilization Studies, John Day Chromites, Oreg.: Bureau of Mines Rept. of Investigations 5238, 1956, 67 pp.
[11] Hundhausen, R. J., Preliminary Investigation of the Takilma-Waldo Copper District, Josephine County, Oreg.: Bureau of Mines Rept. of Investigations 5187, 1956, 21 pp.

465877—58——60

Digitized by Google

**TABLE 8.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1852–1956, in terms of recoverable metals [1]**

| Year | Mines producing [2] | | Material sold or treated [3] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 23 | 36 | 3,673 | 13,760 | $481,607 | 15,191 | $13,748 |
| 1952 | 13 | 25 | 931 | 5,509 | 192,815 | 4,037 | 3,654 |
| 1953 | 8 | 21 | 1,215 | 8,488 | 297,080 | 12,259 | 11,095 |
| 1954 | 20 | 26 | 2,916 | 6,520 | 228,200 | 14,335 | 12,974 |
| 1955 | 19 | 21 | 3,835 | 1,708 | 59,780 | 8,815 | 7,978 |
| 1956 | 15 | 15 | 1,991 | 2,738 | 95,830 | 13,542 | 12,256 |
| 1852–1956 | ---------- | ---------- | (4) | 5,785,316 | 130,449,103 | 5,354,253 | 4,911,132 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 13 | $5,571 | 10 | $3,007 | 6 | $1,757 | $505,690 |
| 1952 | 1 | 484 | 1 | 322 | 1 | 332 | 197,607 |
| 1953 | 9 | 5,166 | 5 | 1,310 | ---------- | ---------- | 314,651 |
| 1954 | 5 | 2,950 | 5 | 1,370 | ---------- | ---------- | 245,494 |
| 1955 | 4 | 2,984 | 3 | 884 | ---------- | ---------- | 71,636 |
| 1956 | 7 | 5,950 | 5 | 1,570 | ---------- | ---------- | 115,606 |
| 1852–1956 | 12,435 | 4,685,953 | 817 | 97,283 | 173 | 23,194 | 140,166,665 |

[1] Includes recoverable metal content of gravel washed (placer operations), old tailings re-treated, ore milled, and ore shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] Figure not available.

percent of capacity, and about 240 workers were employed. The company reported shipments of more than 24,000 tons of ferroalloys and 28,000 tons of carbide in 1956. Three electric furnaces produced ferromanganese and ferrosilicon, used in making iron and steel, and a fourth produced calcium carbide—a source of acetylene used in oxyacetylene torches for welding and cutting and a raw material for synthesis of many organic chemicals.

Ferronickel production at the smelter of Hanna Nickel Smelting Co., Riddle (Douglas County), totaled 12,378 short tons (a 63-percent increase) containing 5,691 short tons of nickel. Feed for the four electric furnaces was derived from ore deposits on top of nearby Nickel Mountain. The company installed the last two in 1956. The third furnace was placed in operation in February and the fourth in April; smelting was begun in the first two furnaces in 1954. Consumption of ore by the smelter, which was shut down over a month beginning August 1 by a strike of the United Steelworkers of America, was 494,212 short tons containing 1.47 percent nickel.

**Gold.**—Although 60 percent higher than in 1955, gold output in the State remained low. Over three-quarters of the State supply came from gold ore extracted from the Boaz Mining Co. Buffalo mine (Grant County). The bulk of this ore was milled at the property; concentrate and remaining crude ore were shipped to the smelter. Recovery of small quantities of gold was reported from Baker, Curry, Jackson, Josephine, Malheur, Umatilla, and Wheeler Counties.

Digitized by Google

**TABLE 9.—Gold produced at placer mines, 1947–51 (average) and 1952–56, by classes of mines and methods of recovery**

| Class and method | Mines producing [1] | Material treated (cubic yards) | Gold recovered | | |
|---|---|---|---|---|---|
| | | | Fine ounces | Value | |
| | | | | Total | Average per cubic yard |
| **Surface placers:** | | | | | |
| **Gravel mechanically handled:** | | | | | |
| Bucketline dredges: | | | | | |
| 1947–51 (average) | 2 | 3,325,140 | 9,252 | $323,792 | $0.097 |
| 1952 | 1 | 2,548,700 | 4,571 | 159,985 | .063 |
| 1953 | 1 | 2,176,000 | 6,935 | 242,725 | .112 |
| 1954 | 1 | 1,382,000 | 4,685 | 163,975 | .119 |
| 1955 | | | | | |
| 1956 | | | | | |
| Dragline dredges: [2] | | | | | |
| 1947–51 (average) | 5 | 437,830 | 2,150 | 75,243 | .172 |
| 1952 | 1 | 5,000 | 27 | 945 | .189 |
| 1953 | | | | | |
| 1954 | 1 | 3,000 | 11 | 385 | .128 |
| 1955 | | | | | |
| 1956 | | | | | |
| Nonfloating washing plants: [3] | | | | | |
| 1947–51 (average) | 3 | 27,380 | 238 | 8,330 | .304 |
| 1952 | 1 | [4] | 5 | 175 | |
| 1953 | | | | | |
| 1954 | 2 | 2,610 | 44 | 1,540 | .590 |
| 1955 [5] | | | 22 | 770 | |
| 1956 | 2 | 1,500 | 26 | 910 | .607 |
| **Gravel hydraulically handled:** | | | | | |
| 1947–51 (average) | 17 | 63,090 | 316 | 11,053 | .175 |
| 1952 | 9 | 27,600 | 147 | 5,145 | .186 |
| 1953 | 9 | 27,500 | 209 | 7,315 | .266 |
| 1954 | 16 | 101,300 | 170 | 5,950 | .059 |
| 1955 | 8 | 24,400 | 103 | 3,605 | .148 |
| 1956 | [6] 8 | 50,990 | 288 | 10,080 | .198 |
| Small-scale hand methods: [7] | | | | | |
| 1947–51 (average) | 7 | 10,370 | 200 | 7,014 | .676 |
| 1952 | 13 | 15,200 | 146 | 5,110 | .336 |
| 1953 | 10 | 9,800 | 138 | 4,830 | .493 |
| 1954 | [8] 5 | 12,400 | 60 | 2,100 | .169 |
| 1955 | 12 | 8,400 | 64 | 2,240 | .267 |
| 1956 | 5 | 3,020 | 40 | 1,400 | .464 |
| **Underground placers (drift):** | | | | | |
| 1947–51 (average) | 1 | 360 | 9 | 315 | .875 |
| 1952 | | | | | |
| 1953 | 1 | 450 | 7 | 245 | .544 |
| 1954 | 1 | 80 | 22 | 770 | 9.625 |
| 1955 | 1 | 150 | 14 | 490 | 3.267 |
| 1956 | | | | | |
| **Grand total placers:** | | | | | |
| 1947–51 (average) | 35 | 3,864,170 | 12,165 | 425,747 | .110 |
| 1952 | 25 | 2,596,500 | 4,896 | 171,360 | .066 |
| 1953 | 21 | 2,213,750 | 7,289 | 255,115 | .115 |
| 1954 | 26 | 1,501,390 | 4,992 | 174,720 | .116 |
| 1955 | 21 | 32,950 | 203 | 7,105 | .216 |
| 1956 | 15 | 55,510 | 354 | 12,390 | .223 |

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Includes all placer operations using dragline excavator for delivering gravel to floating washing plant.
[3] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[4] Data not available.
[5] Includes commercial gravel plant that produced gold from gravels. Byproduct gold is included with gold recovered, but material treated and average value per cubic yard refer only to straight gold dredging.
[6] Includes bucketline dredges, for which Bureau of Mines is not at liberty to disclose output.
[7] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms dip boxes, pans, etc. "Wet" method used exclusively in Oregon.
[8] Includes suction dredge, for which Bureau of Mines is not at liberty to disclose output.

Digitized by Google

TABLE 10.—**Mine production of gold, silver, copper, and lead in 1956, by counties, in terms of recoverable metals**

| County | Mines producing | | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|
| | Lode | Placer | Fine ounces | Value | Fine ounces | Value |
| [illegible] | 5 | 2 | 309 | $10,815 | 943 | $853 |
| [illegible] | [illegible] | [illegible] | 5 | 175 | 1 | 1 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 1 | 1 |
| [illegible] | 2 | 2 | 2,158 | 75,530 | 12,555 | 11,363 |
| [illegible] | 2 | 5 | 121 | 4,235 | 18 | 16 |
| [illegible] | 2 | 4 | 114 | 3,990 | 21 | 19 |
| [illegible] | 1 | 1 | 9 | 315 | 2 | 2 |
| [illegible] | [illegible] | [illegible] | 1 | 35 | [illegible] | [illegible] |
| [illegible] | [illegible] | 1 | 21 | 735 | 1 | 1 |
| Miscellaneous | | | | | | |
| Total | 13 | 15 | 2,738 | 96,830 | 13,542 | 12,256 |

| County | Copper | | Lead | | Total value |
|---|---|---|---|---|---|
| | Pounds | Value | Pounds | Value | |
| [illegible] | 900 | $383 | [illegible] | [illegible] | $12,051 |
| Baker | [illegible] | [illegible] | [illegible] | [illegible] | 176 |
| [illegible] | 400 | 170 | [illegible] | [illegible] | 171 |
| Douglas | 3,300 | 1,487 | 10,000 | $1,570 | 89,959 |
| Grant | [illegible] | [illegible] | [illegible] | [illegible] | 4,251 |
| Jackson | 9,300 | 3,910 | [illegible] | [illegible] | 7,919 |
| Josephine | [illegible] | [illegible] | [illegible] | [illegible] | 317 |
| Malheur | [illegible] | [illegible] | [illegible] | [illegible] | 35 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 736 |
| Wheeler | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Total | 14,000 | 5,950 | 10,000 | 1,570 | 115,606 |

[illegible] "nugget-gruders," and others who gave no evidence of legal [illegible]

TABLE [illegible] gold, silver, copper, and lead in 1956, by classes [illegible] materials, in terms of recoverable metals

| [illegible] | Number of mines | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) |
|---|---|---|---|---|---|---|
| [illegible] | 11 | 1,923 | 2,379 | 13,334 | 2,300 | 9,400 |
| [illegible] | 4 | 68 | 5 | 157 | 11,700 | 600 |
| [illegible] | 15 | 1,991 | 2,384 | 13,491 | 14,000 | 10,000 |
| [illegible] | 15 | (1) | 354 | 51 | [illegible] | [illegible] |
| [illegible] | 30 | 1,991 | 2,738 | 13,542 | 14,000 | 10,000 |

[illegible] Bourne (Grant County) was the scene of [illegible] the quartz-gold mines—Columbia, Tabor [illegible] and Villiard—were leased by the Sun- [illegible] Idaho. No economic mineralization [illegible] subsequently abandoned the project. [illegible] back to about 1861.

Digitized by Google

**TABLE 12.—Mine production of gold, silver, copper, and lead in 1956, by types of material processed and methods of recovery, in terms of recoverable metals**

| Type of material processed and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) |
|---|---|---|---|---|
| Lode: | | | | |
| Amalgamation | 154 | 43 | ---------- | ---------- |
| Concentration, and smelting of concentrates | 1,735 | 12,313 | 2,200 | 9,400 |
| Direct smelting | 495 | 1,135 | 11,800 | 600 |
| Total lode | 2,384 | 13,491 | 14,000 | 10,000 |
| Placer | 354 | 51 | ---------- | ---------- |
| Grand total | 2,738 | 13,542 | 14,000 | 10,000 |

**TABLE 13.—Mine production of gold, silver, copper, and lead in 1956, by counties and districts, in terms of recoverable metals**

| County and district | Mines producing | | Lode material (short tons) | Gold (lode and placer) [2] (fine ounces) | Silver (lode and placer) [3] (fine ounces) | Copper (pounds) | Lead (pounds) | Total value |
|---|---|---|---|---|---|---|---|---|
| | Lode | Placer [1] | | | | | | |
| Baker County: | | | | | | | | |
| Cracker Creek | 3 | 1 | 348 | 187 | 916 | 100 | ---------- | $7,417 |
| Upper Burnt River | 1 | 1 | 30 | 22 | 3 | ---------- | ---------- | 773 |
| Virtue | 1 | -------- | 50 | 74 | 6 | ---------- | ---------- | 2,595 |
| Auburn, Baker, Greenhorn, Sparta [4] | 3 | -------- | 117 | 26 | 18 | 800 | ---------- | 1,266 |
| Curry County: Sixes River | -------- | -------- | -------- | 5 | 1 | ---------- | ---------- | 176 |
| Douglas County: Tiller-Drew | 1 | -------- | 1 | ---------- | 1 | 400 | ---------- | 171 |
| Grant County: Granite, North Fork John Day and Quartzburg [4] | 2 | 2 | 1,417 | 2,158 | 12,555 | 3,500 | 10,000 | 89,950 |
| Jackson County: | | | | | | | | |
| Applegate | 1 | -------- | 2 | 16 | 3 | ---------- | ---------- | 563 |
| Gold Hill | 1 | 2 | 1 | 19 | 2 | ---------- | ---------- | 667 |
| Ashland and Upper Applegate [4] | -------- | 3 | -------- | 86 | 13 | ---------- | ---------- | 3,021 |
| Josephine County: Galice, Grants Pass and Wolf Creek [4] | -------- | 3 | -------- | 91 | 10 | ---------- | ---------- | 3,194 |
| Greenback, Grave Creek and Illinois River [4] | 2 | 1 | 25 | 23 | 11 | 9,200 | ---------- | 4,725 |
| Malheur County: Marmon Basin | -------- | 1 | -------- | 9 | 2 | ---------- | ---------- | 317 |
| Umatilla County: North Fork John Day | -------- | (5) | -------- | 1 | ---------- | ---------- | ---------- | 35 |
| Wheeler County: Spanish Gulch | -------- | 1 | -------- | 21 | 1 | ---------- | ---------- | 736 |
| Total | 15 | 15 | 1,991 | 2,738 | 13,542 | 14,000 | 10,000 | 115,606 |

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Source of gold: 2,384 ounces from lode mines and 354 ounces from placers.
[3] Source of silver: 13,491 ounces from lode mines and 51 ounces from placers.
[4] Combined to avoid disclosing individual company confidential data.
[5] Includes production from property not classed as a mine.

**Iron Ore.**—About 1,000 tons of activated limonite was produced by James Orr, Orr Engineering & Chemical Co., Portland, for use as a desulfurizing agent in manufactured gas. The material was mined and treated at company facilities northwest of Portland in Columbia County and used by the Portland Gas & Coke Co., and by gas plants in Seattle, Tacoma, and Bremerton, Wash. Demand for limonite for this purpose decreased owing to the introduction of natural gas in the Northwest.

Digitized by Google

**Lead.**—The small tonnage of lead credited to Oregon was recovered as a byproduct from gold ore mined by Boaz Mining Co. at the Buffalo mine (Grant County).

**Manganese.**—A small quantity of manganese ore was shipped to the Government, Butte (Mont.), Low-Grade Manganese-Stockpile Depot. Kenneth Cross shipped the ore from the Ranes mine in Baker County. Shipments to low-grade manganese stockpiles are not included in State production totals until the material is removed for commercial use.

**Mercury.**—The comparative stability and continued high price of mercury again resulted in a large increase in production. The 1956 output of 1,893 flasks valued at $492,029 was 79 percent above the 1955 total of 1,056 flasks valued at $306,610. The value of output in 1956 was based on an average New York price of $259.92 per flask. The 1956 total was the highest since 1945, the last peak production year during World War II.

Through 1956 Oregon mines yielded more than 95,000 flasks of mercury (76-pound flasks) valued at over $12 million. Output of the liquid metal was begun in the State at least by 1882, when production of 50 flasks was reported. Output of mercury remained small through World War I and until 1927, when more than 2,000 flasks was produced. The major contributors to the total output in these years were the Black Butte mine in Lane County, the Opalite and Bretz mines in Malheur County, and the Horse Heaven mine in Jefferson County. In 1937, the Bonanza mine (Douglas County), after a period of low, intermittent output, began substantial production, and by 1939 the mine was the second ranking domestic producer. The peak production years for Oregon were 1940 and 1941; over 9,000 flasks was produced from 23 mines in 1940 and approximately the same quantity from 21 mines in 1941.

The bulk of the 1956 output was derived from the Bonanza mine (Bonanza Oil & Mine Corp.) and the Horse Heaven mine (Cordero Mining Co.). Activities leading to the reopening and initial production in the latter part of the year of the Bretz mine (Arentz-Comstock Co.) and the Black Butte mine (Mercury & Chemicals Corp.) also accounted for a substantial part of the total output. Both the Bretz and Black Butte mines yielded a substantial output in previous years but were closed because of low market prices for mercury. Reopening of the Black Butte mine involved considerable rehabilitation of old underground workings and construction of a new surface plant, including erection of a Gould rotary furnace. A DMEA project was active at the property. Operations at the Bretz mine were unusual in that ore from the open pit received an initial concentration by flotation before being roasted in retorts. Data on operation of the flotation process in a continuous circuit were developed at the Federal Bureau of Mines Northwest Electrodevelopment Experiment Station at Albany under a cooperative agreement with the company.

**Nickel.**—Nickel ore was produced by the Hanna Coal & Ore Corp., from its open-pit mine at the top of Nickel Mountain near Riddle in Douglas County. The quantity of ore carried by aerial tram down the mountain to the smelter of the Hanna Nickel Smelting Co. was

Digitized by Google

increased to meet requirements resulting from installation of two new furnaces in the smelter; the total output was 437,316 short tons of ore averaging 1.57 percent nickel. Operations at the mine were at a standstill for about a month in the early fall when mine workers, numbering about 50, observed picket lines established during a strike at the smelter. In addition to the ore utilized at the smelter, ore was shipped to Santa Rosalia, Mexico, for experimental use in the production of nickel matte at a smelter operated by Compania Minera Santa Rosalia.

Exploratory work with two churn drills was conducted throughout 1956, according to a report by the company; 182 holes were drilled to an average depth of 60 feet on 200-foot centers over the entire ore body. Most of the ore mined during the year was derived from bench and road development in the western half of the formation area. Land clearing was completed over the whole ore body, and a permanent haulage road was built near the top of the mountain.

**Silver.**—Byproduct silver was recovered at many Oregon gold mines. Increased gold output was reflected in a 54-percent gain in silver output. The Buffalo mine, operated by Boaz Mining Co., accounted for over 90 percent of the silver produced in 1956.

**Tungsten.**—Production of tungsten ore and concentrate continued to be limited. Output in 1956 was about the same as in 1955. One small shipment was made to a California purchaser from a property in Jackson County.

**Uranium.**—The Lakeview Mining Co. White King mine (Lake County) shipped 400 tons of ore in 1956, compared with 300 tons in 1955. The ore, derived from surface exposures, was shipped to the Vitro Uranium Co. processing plant at Salt Lake City, Utah. Work on a 300-foot, 2-compartment shaft was begun and by the end of the year had reached a depth of about 70 feet. The company planned to sink a larger shaft on the east end of the property after completion of core drilling, which late in the year totaled about 150,000 feet. Drilling to a depth of 800 feet had outlined mineralization about 600 feet wide and 800 feet long, averaging about 0.4 percent uranium oxide. Ore was found on 3 horizons; the upper horizon was about 65 feet thick, and the 2 lower horizons were about 10 to 20 feet thick. Two additional horizons were encountered at greater depth at the east end of the property. Exploration conducted by the company at the nearby Lucky Lass claims was less successful. Prospecting and exploration activity continued in other areas in the State.

**Zirconium and Titanium.**—Production of zirconium sponge was resumed at Albany (Linn County) in the spring of 1956, when the Wah Chang Corp., working under an Atomic Energy Commission (AEC) contract, took over control of certain facilities at the Federal Bureau of Mines Northwest Electrodevelopment Experiment Station. The facilities, owned by the AEC and located on Bureau grounds, had been operated by the Bureau since the late 1940's until they were closed in mid-1955 by the AEC. Production of hafnium sponge was continued by the Bureau of Mines, using hafnium oxide evolved as a coproduct in the Wah Chang operations. The entire output of zirconium and hafnium was consigned to the AEC.

Digitized by Google

The Wah Chang Corp., in addition to operating the AEC-owned facilities under contract, also began constructing its own plant for producing zirconium at a 45-acre site north of Albany. Oregon Metallurgical Corp. began operations early in the summer at its new $750,000 plant on the south edge of the city. The company produced titanium and zirconium ingot from purchased sponge metal.

## MINERAL FUELS

**Carbon Dioxide.**—Recovery of carbon dioxide from mineral waters, as reported by the Gas-Ice Corp. of Portland, increased 5 percent over 1955. The company processed the carbon dioxide to dry ice at its plant near Ashland (Jackson County) and operated a similar plant at Klickitat, Wash.

**Coal.**—Coal production in Oregon dropped to a new low in 1956. The only active operation was the Madrona mine of Lowes Mandrones Coal Mining Co. near Molalla (Clackamas County). The South Slough mine of the Gibbs Coal Co. in Coos County was closed throughout 1956. A coal prospect being developed by Gerald Rannells near Powers (Coos County) was acquired for further development by the Pacific Power & Light Co. of Portland.

In August the Pacific Power & Light Co. began exploring the Eden Ridge coalfield to prove and develop this deposit of high-volatile-C bituminous-grade coal as a source of energy for a 100,000-kw. steam-electric generation plant. The Eden Ridge field is near the south fork of the Coquille River in southeastern Coos County and northern Curry County. An article published in 1956 reviews development of the Eden Ridge coalfield and the companion hydroelectric plant by the Pacific Power & Light Co.[12]

**Petroleum and Natural Gas.**—Activity in petroleum exploration during 1956 was below that in 1955. Seven new drilling permits were issued in 1956 compared with 12 in 1955. Drilling permits were issued to the Riddle Gas & Oil Producers of Oregon, Ltd.; Sunray Mid-Continent Oil Co. (Columbia County); Oroco Oil & Gas Co. (Malheur and Harney Counties); Seneca Oil, Gas, & Development Co. (Grant County); Big Red Uranium Co. (Umatilla County); and Standard Oil Co. of California (Gilliam County).

Delivery of natural gas from fields in New Mexico and Colorado was begun in August through the pipeline facilities of the Pacific Northwest Pipeline Corp. Arrival of natural gas in the State affected the use of oil for industrial purposes. Large industrial operations, such as cement plants, brickkilns, sugar refineries, pulp and paper mills, plywood driers, and metallurgical plants, were shifting or planned to shift to natural gas. Construction of the West Coast Transmission Co., Ltd., pipeline from the Peace River fields of Canada, which was planned to connect with the pipeline system of the Pacific Northwest Pipeline Corp. at Sumas, Wash., continued throughout the year. The project was scheduled for completion in 1957 and would double the capacity of the natural-gas pipeline system in the Pacific Northwest.

[12] Mason, R. S., Eden Ridge Coal To Be Investigated: Oregon State Dept. of Geol. and Min. Ind., The Ore.-Bin, vol. 18, No. 11, August 1956, pp. 67–69.

Digitized by Google

## REVIEW BY COUNTIES

**Baker.**—Production of metals in Baker County remained low in 1956, as in 1955, owing to cessation of operations by Powder River Dredging Co. in September 1954. The output of gold—the major metal produced in the county in 1956—was only 309 ounces compared with more than 5,000 ounces in 1954. Small quantities of gold and associated silver were recovered at lode mines in Auburn, Cracker Creek, Greenhorn, Sparta, Upper Burnt River, and Virtue districts. Norman Gardner Round Top mine (Virtue district) and Kenneth Grabner Bald Mountain mine (Cracker Creek district) were the principal producers. Gold ore shipped to the Tacoma smelter from the latter mine supplied the bulk of the silver recovered in the county, whereas most of the copper came from a property operated by E. L. Pickles of Richland. In the Cracker Creek district, Baker Dredging Co. produced a quantity of gold and some silver in July—the only

**TABLE 14.—Value of mineral production in Oregon, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Baker | (1) | (1) | Cement, stone, sand and gravel, gold, silver, copper, clays. |
| Benton | $259,622 | $377,249 | Sand and gravel, stone, clays. |
| Clackamas | 5,466,527 | 6,485,302 | Cement, sand and gravel, stone, clays. |
| Clatsop | 138,233 | 290,465 | Stone. |
| Columbia | 324,334 | 429,997 | Stone, sand and gravel, iron ore (limonite). |
| Coos | 661,200 | 1,684,398 | Chromite, stone, sand and gravel. |
| Crook | 331,561 | 273,856 | Stone, sand and gravel, mercury. |
| Curry | 100,385 | 91,511 | Chromite, sand and gravel, stone, gold, silver. |
| Deschutes | 976,564 | 1,195,744 | Diatomite, pumice, stone, sand and gravel. |
| Douglas | 2,859,423 | 4,140,753 | Nickel, sand and gravel, mercury, stone, chromite, copper, silver. |
| Gilliam | (1) | 128,412 | Sand and gravel, stone. |
| Grant | 164,032 | 373,746 | Chromite, sand and gravel, gold, silver, lead, copper. |
| Harney | 57,640 | 34,053 | Stone, pumice, sand and gravel. |
| Hood River | 111,403 | 82,150 | Stone, sand and gravel. |
| Jackson | 3,154,159 | 3,330,672 | Cement, stone, sand and gravel, clays, carbon dioxide, gold, chromite, tungsten, silver. |
| Jefferson | 183,867 | 206,762 | Mercury, stone. |
| Josephine | 890,216 | 936,027 | Chromite, stone, sand and gravel, gold, copper, clays, silver. |
| Klamath | 484,100 | 389,636 | Stone, sand and gravel, clays. |
| Lake | 76,580 | 234,327 | Stone, sand and gravel, mercury. |
| Lane | 2,601,105 | 2,029,907 | Sand and gravel, stone, mercury. |
| Lincoln | 606,830 | 355,917 | Stone. |
| Linn | 585,045 | 615,949 | Sand and gravel, stone, clays. |
| Malheur | 1,041,027 | 637,258 | Sand and gravel, stone, mercury, clays, gold, silver. |
| Marion | 529,616 | 454,375 | Sand and gravel, stone, clays. |
| Morrow | 139,137 | 77,574 | Stone. |
| Multnomah | 2,911,222 | 2,596,652 | Sand and gravel, stone, clays. |
| Polk | 275,783 | 778,553 | Do. |
| Sherman | 1,276,500 | 274,922 | Stone, sand and gravel. |
| Tillamook | 180,606 | 418,033 | Sand and gravel, stone, clays. |
| Umatilla | 622,408 | 836,376 | Sand and gravel, stone, gold. |
| Union | 335,802 | 320,991 | Stone, sand and gravel, clays. |
| Wallowa | 258,008 | 133,928 | Stone, sand and gravel. |
| Wasco | 309,307 | 188,732 | Sand and gravel, stone. |
| Washington | 1,349,758 | 810,489 | Sand and gravel, stone, clays. |
| Wheeler | 21,106 | 736 | Gold, silver. |
| Yamhill | 198,247 | 324,677 | Sand and gravel, stone, clays. |
| Undistributed [2] | 3,386,592 | 3,812,592 | |
| Total [3] | 31,736,000 | 34,011,000 | |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes value of stone, gem stones, sand and gravel and mercury that cannot be assigned to specific counties and values indicated by footnote 1.
[3] Total adjusted to eliminate duplicating value of clays and stone.

Digitized by Google

sizable placer output in the county. In 1956, as in 1955, manganese ore was shipped from the Ranes mine. Kenneth Cross, the operator in 1956, shipped ore to the Government Butte (Mont.) Low-Grade Stockpile Depot.

Cement, stone, sand and gravel, and clays were the principal nonmetal commodities produced in Baker County in 1956. Oregon Portland Cement Co. continued producing portland cement at its plant at Lime; the output was slightly above that in 1955. The company mined and processed limestone and shale to meet raw-material requirements for the plant. National Industrial Products Corp. operated a limestone quarry near Durkee. Most of the production was sold to sugar refineries, papermills, and cement plants; smaller quantities were used at metallurgical plants and foundries. Construction of a 2-kiln lime plant for the Chemical Lime Co., northwest of Baker, was continued in 1956, and the plant was scheduled for completion in mid-1957. Blue Granite monumental stone was quarried from the Haines granite quarry by the Northwestern Granite Co. Logsdon Sand & Gravel Co. produced building and road gravel from its plant near Baker, and contractors for the State highway department supplied gravel and stone for road building and maintenance. Crushed stone for road surfacing and maintenance was supplied to the Bureau of Public Roads by contractors. Petrified-wood gem stones were collected in the county in 1956.

**Benton.**—Sand and gravel, stone, and miscellaneous clay were nonmetal commodities produced in Benton County. Sand and gravel for building and road use was processed by four commercial operators, and output was considerably above that in 1955. Output was recorded for Beaton Sand & Gravel Co., Builders Supply Co., Corvallis Sand & Gravel Co., and Tri-County Rock Co. Crushed stone for use as riprap and roadstone was produced by S. W. Groesbeck and Corvallis Sand & Gravel Co., respectively. Contractors supplied basalt to the State highway department for road use. Corvallis Brick & Tile Co. produced heavy clay products from clay obtained from a pit near Corvallis, and Monroe Clay Products Co. operated its claypit and brick kiln at Monroe. Production of clay in the county was slightly above that in 1955. A few purple-agate gem stones were collected by H. H. Jenne of Bend.

**Clackamas.**—Clackamas County ranked first in Oregon in value of nonmetals produced in 1956. Output of cement, sand and gravel, stone, and clays valued at more than $5 million was reported. Oregon Portland Cement Co. continued to produce portland cement at its Oswego plant. During the year a new kiln placed in operation by the company brought to three the number operating at the Oswego plant. Limestone was supplied from the company limestone quarry at Dallas (Polk County).

The county ranked second in production of sand and gravel in the State, owing to a combined output of more than 1 million tons by 10 commercial operators. Portland Gravel Co. and Portland Road & Driveway Co. were the leading producers of sand and gravel in the county. County road crews and contractors supplied the county highway department with road surfacing and maintenance materials, and contractors furnished crushed stone and road gravel to the State highway department. Crushed basalt for road surfacing and main-

Digitized by Google

tenance was supplied to the Bureau of Public Roads by contractors, and basalt for use as riprap was furnished under contract to the United States Army Corps of Engineers. Weyerhaeuser Timber Co., from a quarry near Molalla, obtained and crushed basalt for forest access roads. Needy Brick & Tile Co. and Hubbard Clay Works, both of Hubbard, and Molalla Brick & Tile Co., Molalla, mined clays for processing into heavy clay products.

The Madrona mine of Lowes Mandrones Coal Mining Co. of Molalla was the only active coal mine in the State. Production was small. Agate and jasper gem stones were recovered in the Sunflower Flats area south of Mount Hood.

**Clatsop.**—Astoria Crushed Rock Co. and Rock Creek Crushed Rock Co., both of Astoria, produced crushed stone for concrete and roadstone. Three contractors supplied basalt for road building and maintenance and a small quantity to the State highway department for riprap.

**Columbia.**—Limonite deposits near Scappoose were the source of iron oxide mined and treated by Orr Engineering & Chemical Co. of Portland and marketed to manufactured-gas plants in Portland and in Seattle, Tacoma, and Bremerton, Wash. The product was used as a sulfur-removing agent in purifying the gas.

Two commercial operators produced building and road gravel and railroad ballast. Parker Schram Co. produced railroad-ballast gravel and stock-car sand for the Spokane, Portland & Seattle Railway Co. The railroad company and Goodat Crushed Rock Co. quarried and crushed basalt for riprap and roadstone, respectively. Contractors supplied crushed stone to the State highway department and to the United States Army Corps of Engineers for road use and riprap. County road crews crushed and processed basalt for road material and riprap. C. K. Williams & Co. obtained crude iron oxide pigments (limonite) from a deposit near Scappoose. The material was shipped to out-of-State consumers for use in paints. Orr Engineering & Chemical Co. made iron oxide pigments at the company plant at Scappoose. Sunray Mid-Continent Oil Co., Los Angeles, Calif., applied for a permit to drill five stratigraphic coreholes near Scappoose.

**Coos.**—Value of mineral production in Coos County increased considerably over 1955 owing to inclusion of the value of chromite concentrate produced in 1955 and 1956 by Pacific Northwest Alloys, Inc. This output came from low-grade concentrate produced and stockpiled for the Government during World War II. The stockpile at Coquille was beneficiated under Government contract by electromagnetic- and electrostatic-separation methods. Upgraded concentrate was shipped to a company plant at Mead, Wash., for conversion to ferrochromium. (See Chromium in commodity section.) A small quantity of newly mined chromite was produced. Ore and concentrate were shipped to the Government Grants Pass (Oreg.) Purchase Depot by O. K. Coster and C. C. Wikstrom from the Rock Creek and Foster Creek properties.

Hillstrom Rock Quarry, Inc. (Coos Bay) and Bandon Rock Co. (Bandon) crushed basalt for road building and maintenance. Contractors supplied the State highway department with basalt and gravel for road use and with a small quantity of riprap. Coos County

Digitized by Google

Highway Department crews produced roadstone and riprap and processed gravel for paving and road use. Sand and gravel was produced by E. E. Benham, Coquille; and Rogers & Kuni, Coos Bay. Fierke Sand & Gravel Co. processed sand and gravel for use by the Southern Pacific Railway Co. from an operation near Hauser. The South Slough mine of the Gibbs Coal Co. (Coquille) was inactive. Development at the Peacock coal mine was taken over from Gerald Rannells at the beginning of the year by Pacific Power & Light Co. of Portland. The company began extensive exploration of the Eden Ridge coalfield to develop this deposit as a source of energy for a proposed 100,000-kw. steam-electric generating plant near the Eden Ridge field.

**Crook.**—Four operators produced small quantities of mercury from properties in Crook County. Owen Pigmon produced a few flasks of the liquid metal during cleanup operations preparatory to abandoning the New Amity mine. Other operators were the Eickemeyer Bros. at their Maury Mountain mine, Frank Reid at the Round Mountain No. 2 mine, and Towner Motor Co. at the Lost Cinnabar No. 1 mine.

The Cinder Hill Co. of Redmond crushed and prepared cinders for use on roads and driveways and for railroad ballast. The company also crushed basalt for roadstone and riprap. Crushed cinder was supplied to the State highway department by Cartwright Construction Co. for road maintenance, and Knorr Sand & Gravel Co. and Prineville Sand & Gravel Co. produced building, paving, and road sand and gravel. Agate and thunder-egg gem stones were recovered near Prineville.

**Curry.**—One of the largest chromite operations in the State was active in Curry County. The McCaleb mine and mill of B. A. and R. E. McCaleb ranked third (under Wm. S. Robertson in Josephine County and Comstock Uranium-Tungsten Co., Inc., in Grant County) in quantity and value of chromite produced in 1956. The McCaleb mine was worked under contract by Ralph and Katie Kaiser. Howard Beasley produced and shipped a substantial tonnage of concentrate from the Sourdough property. Other active properties were the Rosie Chrome (L. E. Chesser and Fred Baumgartner) and the Fourth of July (Fred Gardner & Sons). A small quantity of chromite ore was also shipped by Gus Kelly. One placer operation was reported; a few ounces of gold and silver were recovered from glacial till by ground sluicing at the Frank C. Lawrence Thompson Flat placer.

Sand and gravel and stone were the only nonmetals produced in the county in 1956. Brookings Red-E-Mix Construction Co. produced building and road gravels; City Sand & Gravel Co. (Gold Beach) produced building sand and road gravel; and Warren Northwest, Inc., crushed and prepared paving and road gravel from portable plants near Port Orford and Brookings. Contractors supplied the State highway department with paving and road gravel and a small quantity of crushed basalt.

**Deschutes.**—Diatomite continued to be the most valuable nonmetal produced in the county. Great Lakes Carbon Corp., Dicalite Division, contined to mine and prepare diatomite from its pit west of Terrebonne. Central Oregon Pumice Co. and Lloyd A. Williamson (both of Bend) mined and prepared pumice, chiefly for use as concrete aggregate. The companies marketed the material throughout the

Digitized by Google

Pacific Northwest, British Columbia, and northern California. Deschutes Concrete Products Co. (Redmond) reported its pumice pit inactive in 1956. Sand and gravel was processed into building and road materials by the Bend Aggregate & Paving Co., and gravel for road use and fill was produced by Warren Northwest, Inc., and the Great Northern Railway Co., respectively. Allum Bros. supplied crushed basalt to the State highway department for road use, and contractors supplied cinder to the State highway department and the Bureau of Public Roads.

**Douglas.**—The principal mineral industry of Douglas County centered about operations of the Hanna Coal & Ore Corp. and the affiliated Hanna Nickel Smelting Co. at Riddle. Both concerns were subsidiaries of the M. A. Hanna Co. Nickel ore from an open pit near the top of Nickel Mountain was moved by aerial tram down the mountainside to the smelter, where it was smelted in electric furnaces to produce ferronickel. Output from the smelter rose substantially in 1956, owing to installation of two additional electric furnaces. A strike of workers at the smelter halted operations from August 1 through the early part of September. Picket lines were observed by workers at the mine, and over 450 smelter and mine employees were idle. The dispute arose when the union contract expired before labor and management were able to agree on wage increases and side benefits. (See Ferroalloys and Nickel in commodity section).

The Bonanza mine of Bonanza Oil & Mine Corp. near Sutherlin was the only mercury producer in the county and the principal producer in the State. A total of 11,903 tons of ore fed into the oil-fired Gould rotary furnace yielded nearly 1,000 flasks of mercury. The company reported that a D-type retort was installed at its surface plant for use in final cleanup and that an extensive DMEA program was completed at the mine with favorable results in 1956. Exploration totaled 3,568 feet of drifting, raising, and crosscutting and extension of the No. 40 winze from the 1,150 to the 1,260 level. Drifting on the 1,150 and 1,260 levels disclosed strong vein structures, and 500 feet of drifting was begun on the 1,150 level to undercut a favorable ore zone on the 830 level.

Two chromite operations were reported in the county. Dorothy Kartes and T. M. Petrie shipped ore to the Government stockpile at Grants Pass from the Nickel Mountain and Yellow Jacket mines, respectively. A. N. Moore shipped a small quantity of copper ore containing silver to the Tacoma smelter from the Cougar mine, 4 miles southwest of Drew.

Sand and gravel and stone were the principal nonmetals produced in 1956. Five commercial operators processed sand and gravel to building and road materials. Umpqua River Navigation Co., Roseburg Sand & Gravel Co., Whipple Logging Co., and J. D. Walling were the major producers. The State highway department and county road department contracted for their requirements of road-building and maintenance gravel. J. D. Walling of Sutherlin operated a portable crushing plant and prepared basalt for roadstone, riprap, and railroad ballast. A small quantity of limestone for agricultural use was produced by the Yount Lime Co., Roseburg. Five contractors supplied crushed basalt to the State highway department, and two contractors furnished the Bureau of Public Roads with crushed basalt

Digitized by Google

for road surfacing. Crushed stone for use by the Douglas County Road Department was supplied from county-operated crushers.

**Gilliam.**—Sand and gravel and stone were the only mineral commodities produced in Gilliam County. Vernie Jarl contracted to supply crushed stone to the State highway department, and county road crews supplied paving and road gravel. In December the Standard Oil Co. of California obtained a permit to drill a deep stratigraphic hole near Condon.

**Grant.**—Grant County again ranked second in the quantity and value of chromite produced in Oregon, after dropping to third place behind Curry County in 1955. The leading producer was Comstock Uranium-Tungsten Co., Inc., at the Haggard-New mine. The company exposed high-grade ore by means of a 330-foot development drift in the latter part of 1955. A substantial quantity of concentrate and some ore was trucked to the Grants Pass depot from the Ward & Zero property, operated by Wm. Gardner. Other producing properties included the Twin Ridge (Freeman and Miller), Dunn (Albert Dunn), Hopeful and Red Hill (Arthur Moothart), Lost Buck (C. B. Short and B. A. Bailey), and Dry Camp (W. A. and J. I. Stinnett).

The Boaz Mining Co. Buffalo mine in Granite district continued to provide the bulk of the gold, silver, and lead and part of the copper produced in Oregon. The output of 169 tons of concentrate containing about 1,700 ounces of gold and over 12,000 ounces of silver was slightly higher than that in 1955. In the Quartzburg district Kenneth Watkins shipped copper ore containing some gold, silver, copper, and lead to the Tacoma smelter. Small quantities of gold were recovered from the Davis Creek and Dixie Trail placers by H. L. Bruneau and from the Morning Star placer by Tom Jackson.

The John Day Gravel Co. (John Day) mined building sand and gravel, and E. H. Itschner Co. (Molalla) produced paving and road gravel. Petrified wood was obtained by collectors in Grant County in 1956. In November the Seneca Oil, Gas, & Development Co. of John Day was issued a permit for oil-well test drilling.

**Harney.**—Stone, sand and gravel, pumice, and cinder for highway use were the principal nonmetals produced in Harney County. Burns Sand & Gravel Co. prepared a small quantity of gravel. Harney Concrete Tile Co. (Burns) mined crude pumice for use as ballast and prepared pumice for use as concrete aggregate. Pit-run and crushed cinder was produced for the State highway department by Babler Bros., Inc. In October the State issued a permit for test drilling to Oroco Oil & Gas Co. of Payette, Idaho.

**Hood River.**—Jerry's Sand & Gravel Co. produced building sand and gravel from a pit near Cascade Locks. The Hood River County Road Department crushed basalt for road building and maintenance.

**Jackson.**—The small output of gold and silver in Jackson County in 1956 came from the Berton Peak (George Tucker) and Winkler (W. R. Winkler) lode mines in the Applegate and Gold Hill districts, respectively, and from placer operations in the Ashland district (W. T. Grossman), Gold Hill district (George W. Brewer and K. G. Kincaid), and Upper Applegate district (Everett Adams and O. N. Snavely). Three operators produced small quantities of chromite concentrate. The concentrate was shipped to the Government stock-

Digitized by Google

pile depot by Chester Z. Ball and J. W. Kruse (Blackboy Nos. 1, 2, and 3), McCaleb and Kaiser (Wonder), and Loren Schmid (Schmid). Roy Parmenter shipped a small quantity of tungsten concentrate to a California buyer.

Output of cement, stone, sand and gravel, clay, and carbon dioxide was valued in excess of $3 million in 1956. As in 1954 and 1955, Jackson County ranked second in the State in total value of nonmetals production. Ideal Cement Co., Pacific Division, operated its portland-cement plant at Gold Hill. The plant was supplied with limestone and shale from the company-operated Marble Mountain quarry (Josephine County) and the Gold Hill shale quarry (Jackson County), respectively. County road department crushers supplied stone for road building and maintenance. The State highway department contracted for crushed basalt for highway needs, and the Bureau of Reclamation contracted for a small quantity of basalt for riprap. Medford Concrete Construction Co., Inc., and M. C. Lininger & Sons (both of Medford) processed sand and gravel for building, paving, and road uses. Jackson County road crews produced prepared and pit-run sand for road use, and two contractors supplied the State highway department with road gravel. Bristol Silica Co. quarried and crushed quartz near Rogue River. The quartz was marketed for abrasive and filter purposes and for making ferrosilicon. Production increased over that in 1955. The company also quarried and crushed granite, which was marketed for chicken grit.

The Gas-Ice Corp. continued to recover natural carbon dioxide from water wells near Ashland. The operation, the only one of its kind in the State, reported a slightly higher output in 1956 than in 1955.

**Jefferson.**—The only metal ore produced in Jefferson County came from the Horse Heaven mercury mine, 45 miles west of Madras, operated by Cordero Mining Co. The company mined and processed 9,355 tons of ore, containing an average of 0.25 percent mercury, in a 25-ton rotary furnace. Recovery of more than 700 flasks made the mine the second-ranking source of mercury in the State.

The Bureau of Reclamation (Deschutes Project) contracted for rock fill from the R. A. Heintz Construction Co. Babler Bros., Inc., crushed basalt to supply the road building and maintenance requirements of the State highway department.

**Josephine.**—Josephine County again ranked first in the State in the quantity and value of newly mined chromite. The entire output was shipped to the Government Grants Pass (Oreg.) Purchase Depot. The output totaled 5,786 short tons, a considerable increase over the 1955 figure (3,284 tons). The Oregon Chrome mine—owned and operated by Wm. S. Robertson—continued to be the major producer in the county and State, shipping crude lump ore and fines. J. G. Gallaher, at a mill at Wilderville, produced concentrate from low-grade material from the Oregon Chrome mine. Substantial quantities of chromite were shipped by Fred Langley and C. W. Dean from the Lucky Hunch mine, discovered in 1956, and by M. J. McShane and M. E. Adams from the Black Prince mine. C. E. Nichols also shipped ore from the Black Prince mine. Other producing properties included the Black Hawk (Pat Arnot), Paradise No. 2 (Ashland Mining Co), Deep Gorge (J. N. Grissom), Chrome King No. 1 (Roy Hansen and Lewis & Calhoun), Lucky Star (Lewis & Calhoun), Esterly (Black

Digitized by Google

Sheep Mining Co.), Rancheree (E. K. McTimmonds), Lucky L & R (R. W. Radcliffe), Crown Chrome (Carl Stevens), and Shady Cove (George Tulare).

Copper ore shipped from the Fall Creek mine by J. W. Pressler comprised a large part of the small output of copper in Oregon. Gold and silver were recovered from this ore and from ore shipped by Frank E. Gelhous to the Tacoma smelter. Quentin Stone recovered gold and some silver at the Last Chance placer in the Galice district. The Blue Channel placer—operated by M. H. Davis in the Wolf Creek district—also yielded gold and silver.

Rogue River Sand & Gravel Co., Grants Pass Sand & Gravel Co., Mark Axtell, and M & M Sand & Gravel Co., all of Grants Pass, processed sand and gravel for building and road use. F. L. Sommers supplied road gravel to the State highway department under contract. Ideal Cement Co., Pacific Division, obtained limestone from its Marble Mountain quarry for use at the company cement plant at Gold Hill. (Jackson County). C. R. O'Neil supplied crushed roadstone to the State highway department. A small quantity of clay was mined for use by the Macfarlane Brick Plant at Grants Pass.

Klamath.—Stone, sand and gravel, and clays were produced in the county. Warren Northwest, Inc., crushed basalt for roadstone, and contractors supplied the State highway department and the Bureau of Reclamation with road metal and riprap, respectively. Contractors also supplied crushed cinder for State highway use. Sand and gravel for buildings and roads was prepared by O. A. McCord and Farmers Sand & Gravel Co., both of Klamath Falls. The Great Northern Railway Co. produced gravel for railroad ballast. Klamath Falls Brick & Tile Co., at its plant at Klamath Falls, produced structural clay products from locally mined clays and clay from Lincoln, Calif., purchased by the company to supplement the local supply. Output of clays in 1956 was larger than in 1955.

Lake.—A small quantity of mercury was recovered by M. M. Stalnaker at Glass Buttes, about 50 miles west of Burns. After the discovery of commercial uranium deposits near Lakeview in mid-1955, Lakeview Mining Co. proceeded rapidly with development of the White King and Lucky Lass properties, sites of the original discoveries. A second shipment of ore—the first was made in October 1955—was made in August to Vitro Uranium Co., Salt Lake City, Utah. The company drilled extensively at the properties and made aerial surveys of surrounding areas. Construction of a 300-foot, 2-compartment shaft was begun at the White King mine. (See Uranium in commodity section.)

Allum Bros. and the Lake County Highway Department crushed basalt for county roadwork. Two contractors (Allum Bros. and A. C. Compton Co.) produced crushed basalt for the State highway department. Crushers operated by county highway department crews prepared gravel for paving and road use. A. M. Matlock of Eugene reported a small output of sodium carbonate from potholes in the Alkali Lake area. A little obsidian (volcanic glass) was collected near Glass Buttes as gem material.

Lane.—Mercury & Chemicals Corp. began producing mercury late in 1956 at the old Black Butte mine, 16 miles south of Cottage Grove, the only metal-mining operation in the county. The mine was

Digitized by Google

active before 1900, and production was reported in 1908–09 and during World War I. The bulk of the mercury was produced during continuous operation from 1927 through 1942, when the mine was closed. Over 15,000 seventy-six pound flasks of mercury has been recovered at the property, with a reported value of nearly $1.5 million. In 1956 the Mercury & Chemicals Corp. leased the mine with an option to purchase it. The company completed preparatory work in November, including erection of a 70-ton-per-day, oil-fired Gould rotary kiln and 24 upright cast-iron condensers, and at the end of the year had furnaced nearly 2,300 tons of ore. About 30 workers were employed. In November the firm was awarded a $62,340 DMEA contract for exploring the deposit.

Silicon metal was produced by National Metallurgical Corp. at its plant at Springfield.

Sand and gravel output in Lane County totaled over 1 million tons in 1956. Production was attributed to 13 commercial operators. The county, which ranked first in value of sand and gravel output in 1955, dropped to third place in 1956. Crushers operated by the county highway department and contractors supplied gravel for use on county roads. Contractors supplied the State highway department with gravel for road construction and maintenance, and C. B. White contracted to supply road-construction gravel to the United States Army Corps of Engineers.

Stone was the only other nonmetal produced in 1956. Basalt was quarried and crushed by five commercial operators; production was used for roadstone, riprap for flood control, and railroad ballast. Ten contractors supplied the crushed stone required by the Lane County engineer, the Bureau of Public Roads, and the United States Army Corps of Engineers. Eight other contractors supplied the State highway department with roadstone and a small quantity of riprap.

**Lincoln.**—Yaquina Head Quarries (Newport) produced crushed basalt for roadstone riprap. Crushed basalt for road use also was prepared by L. R. Kauffman, Waldport; and Calkins Crushing Co., Ocean Lake. Contractors furnished roadstone (basalt) for highway construction and maintenance to the State highway department.

**Linn.**—A vigorous mineral-processing industry was born in Linn County in 1956 as a result of research at the Federal Bureau of Mines Northwest Electrodevelopment Experiment Station in Albany. A project, begun in 1945 to develop a process to produce zirconium of high purity, was completed under the technical leadership of Dr. W. J. Kroll, a noted metallurgist from Luxembourg, to the extent that zirconium of the quality sought by AEC could be produced at a reasonable price. The Commission provided funds for a plant that applied the reduction techniques to produce zirconium pure enough to be soft for rolling into sheet and to resist the corrosion encountered in atomic piles and powerplants using fissionable fuels. For several years the Albany Station was the one source of zirconium meeting the rigid specifications required for developing the AEC program for atomic weapons and atomic fuels. The plant capacity was increased twice; $3 million was spent for facilities, and the operating budget was $2 million a year. Over 1 million pounds of zirconium was shipped to fabricators of atomic reactors and engines using atomic fuel

465877—58——61

Digitized by Google

before private producers were able to supply metal that would meet the rigid specifications demanded by AEC.

In 1955 operation of the plant by the Bureau of Mines was terminated, and it was idle until reopened in 1956 by the Wah Chang Corp. under contract with AEC. Later in 1956, Wah Chang expanded capacity by building additional similar facilities on the north edge of the city. Albany was selected because of the availability of scientific and technically trained manpower, electric energy, and suitable plant sites.

A new company, Oregon Metallurgical Corp., formed early in the year, moved rapidly ahead with construction of a plant on the south edge of the city to produce zirconium and titanium ingot from imported zirconium and titanium-sponge metal. The plant began to operate in the summer of 1956.

A hafnium compound—byproduct of the Wah Chang zirconium operations—was converted to hafnium metal by the Bureau of Mines under contract with AEC, and research on production and utilization of these and other metals was continued at the Bureau of Mines Albany laboratory.

Sand and gravel, stone, and clay valued at more than $600,000 were produced in Linn County in 1956. Output of sand and gravel was below the 1955 figure. Sand and gravel from commercial operations was used chiefly for roads and buildings. County crews, contractors, and commercial suppliers furnished the Linn County Highway Department with sand and gravel for roadwork, and the State highway department contracted for a small quantity of road gravel. Harbert Bros. and Floyd Graham Construction Co. produced riprap from basalt for use in river revetments by the United States Army Corps of Engineers. Brownsville Sand & Gravel Co. reported output of roadstone. Contractors supplied crushed stone to the State highway department, Linn County Highway Department, and Bureau of Public Roads. Locally mined clay was processed into heavy-clay products by the Albany Brick & Tile Co. at its Albany plant.

**Malheur.**—After extensive preparatory work, the Arentz-Comstock Mining Venture began operating the old Bretz mercury mine on the Oregon-Nevada border near McDermitt, Nev., on December 1 and produced considerable mercury by the end of the year. The company mined 22,700 tons of crude ore from open pits. A method of recovery was used that was considered an unusual departure from the more common method of feeding crushed, crude ore directly into a furnace or retort. Concentrate from a 150-ton-per-day flotation plant, comprising a Dorr classifier, 6 Denver flotation cells, a thickener, and a filter, was fed into 2 Pacific Foundry D-retorts. The Bretz mine was formerly one of the larger mercury producers in the State; over 12,000 flasks of mercury was recovered from 1931 to 1942, when operations were last reported.

A few ounces of gold and silver were produced from the O. K. placer on Shasta Creek in the Mormon Basin district by Elton B. Taylor during test work in the summer.

The N. A. Toole Construction Co. produced paving and road gravel at a portable plant near Ontario; Gravel Products Co. prepared building sand, and building, paving and road gravels; and C. E.

Digitized by Google

Leseberg crushed gravel for road and paving use. Crews of the county highway department supplied their own road-gravel requirements, and contractors produced road and surfacing materials for the State Highway Department and the Bureau of Public Roads. The State contracted for crushed basalt for road surfacing and maintenance and for a small quantity of riprap. Oregon Clay Products, Inc., of Vale, mined clay for use in building brick. In September a permit for test drilling was issued to Oroco Oil & Gas Co. of Payette, Idaho. Agate and petrified wood were obtained by gem-stone collectors in the county.

**Marion.**—Sand and gravel was processed for building and road purposes by four commercial operators in 1956. The Marion County Highway Department contracted for road gravel, and county road crews dug a quantity of pit-run gravel. The State highway department was supplied with sand and gravel for highway construction and maintenance by three contractors. Oregon Tuff Stone Co., Inc., obtained volcanic-tuff building stone from the company quarry southeast of Sublimity. County-operated crushers prepared stone for road surfacing and maintenance. The Donald Brick & Tile Co. of Donald mined clay for use in building brick and tile and draintile.

**Morrow.**—County-operated crushers prepared basalt for county road use, and the State highway department obtained crushed stone for road maintenance from two contractors. Collectors reported obtaining thunder-egg gem stones in Morrow County in 1956.

**Multnomah.**—With the exception of the relatively new mineral-processing industries in Douglas (nickel), Lane (silicon), and Linn (hafnium, titanium, and zirconium) Counties, Multnomah County continued to be the center of mineral-processing activity in the State. Reynolds Metals Co. produced aluminum from imported alumina at Troutdale throughout the year and embarked upon a large expansion program. In Portland, calcium carbide was produced by Pacific Carbide & Alloys Corp. and Union Carbide & Carbon Corp.; ferromanganese, ferrosilicon, and calcium carbide were produced by Electro Metallurgical Co.; caustic soda and chlorine were manufactured by Pennsylvania Salt Manufacturing Co.; and Oregon Steel Mills, operating electric furnaces and a rolling mill, produced steel products.

Multnomah County ranked fourth in the State in total value of nonmetallic-mineral output. Sand and gravel, stone, and clays were the principal nonmetals produced in 1956. In addition, perlite, shale, soapstone, and vermiculite obtained from out-of-county and out-of-State sources were processed by firms within the county. The county ranked first in the State in production of sand and gravel; 9 companies processed more than 2.5 million tons. County crews produced prepared and pit-run road gravel, and contractors supplied sand and gravel to the State highway department and the city of Portland. Joe Marston operated the Rocky Butte quarry and produced rough-dimension basalt for use as tunnel lining. Output from this quarry was higher than in 1955. Basalt for road metal was used by the Multnomah County Highway Department and the State highway department, and a small quantity of riprap was produced by contractors for the United States Army Corps of Engineers and the State highway department.

Digitized by Google

Two of Oregon's largest brick plants were situated in the county. Columbia Brick Works, at its plant near Gresham, produced face and common brick and structural tile, and the Sylvan Brick Co. of Sylvan produced building brick. Smithwick Concrete Products Co. expanded shale mined in Washington County at its Portland plant. The expanded product was used as lightweight aggregate in building blocks and tile and brick. Pacific Stoneware Co. processed clays for flowerpots. Supreme Perlite Co. operated its perlite-expanding plant at North Portland. Crude perlite from Nevada was expanded at the Portland plant for marketing throughout the Pacific Northwest. Vermiculite-Northwest, Inc., processed crude vermiculite from Montana at its exfoliation plant. Stauffer Chemical Co. and Miller Products Co. ground and processed soapstone, mined in Washington, for use in insecticides. The glass-container manufacturing plant of Owens-Illinois began operations in 1956, and the first delivery of glass containers from the plant was made in August. Raw materials used at the plant were from out-of-State sources.

**Polk.**—Two companies processed gravel for paving and road use, and the State highway department contracted for surfacing and maintenance gravel. Polk County Lime Co. (Dallas) operated a limestone quarry and crusher near Dallas, and Oregon Portland Cement Co. obtained limestone from the company-owned quarry near Dallas for use at the Oswego cement plant, Clackamas County. Riprap was supplied to the United States Army Corps of Engineers under contract. Monmouth Brick & Tile Co. of Monmouth mined clay for processing into building brick and draintile. Production increased slightly over that in 1955.

**Sherman.**—The Sherman County Road Department and Roy L. Houck & Sons produced crushed basalt for roadstone, and Vernie Jarl supplied crushed stone and road gravel to the State highway department. Basalt for riprap was quarried by contractors for the United States Army Corps of Engineers.

**Tillamook.**—Dolan Construction Co. of Tillamook processed gravel for road metal and railroad ballast. County highway-department crews produced gravel for road building and maintenance, and three contractors furnished the State highway department with crushed road gravel. Tillamook Clay Works mined clay and produced heavy clay products at its plant southeast of Tillamook. An increase was reported in clay output over that in 1955.

**Umatilla.**—A small quantity of gold recovered by Bill Hekkala while prospecting in 1955 was the only metal production credited to the county in 1956.

Four companies produced sand and gravel for building and road use, and O. O. Felthouse of Hermiston produced engine and stock-car sand. The county road department reported output of prepared and pit-run road gravel, and a small quantity of gravel was obtained under contract. Four contractors supplied the State highway department with paving and road gravel. Umatilla County Road Department crews crushed stone for road and riprap use, and five contractors crushed basalt for State highway construction.

The Big Red Uranium Co., Vancouver, Wash., received a permit to drill an exploratory oil well.

Digitized by Google

**Union.**—The State highway department awarded Arthur Simonsen & Co. of Baker a contract for production of crushed stone and cinders for highway construction and maintenance. The county highway department produced pit-run gravel for highway use, and Cartwright Construction Co. and Arthur Simonsen & Co., under contract to the State, supplied crushed and pit-run gravel for road and paving purposes. La Grande Brick Co. mined clay for building brick and tile. The mineral output of the county was about the same as in 1955.

**Wallowa.**—Stone and sand and gravel were the only nonmetals produced in the county in 1956. Wallowa County road crews crushed stone for use on county roads, and C. C. Meisel supplied road gravel. Limestone for use at calcium carbide plants and for agricultural use was obtained by Greely Lime Co. from its Black Marble quarry near Enterprise; production was reported slightly higher than in 1955.

**Wasco.**—Harvey Machine Co. completed financial and contractual arrangements and began construction work on a multi-million-dollar, 54,000-ton-annual-capacity, aluminum-reduction plant on a 500-acre site near The Dalles. The large quantities of electric power required by the plant were to be provided through BPA-constructed transmission lines extending from the Big Eddy switching station. Production of aluminum was expected to begin late in 1957.

Sand and gravel and stone were the only nonmetals produced in Wasco County. The Dalles Concrete Products Co., The Dalles Sand Co., and The Dalles Ready-Mix produced sand and gravel for building and road construction. In addition, The Dalles Concrete Products Co. produced masonry sand and gravel for filter purposes. United Construction Co. supplied a small quantity of road gravel for State highway work, and contractors supplied the United States Army Corps of Engineers with gravel for use at The Dalles Dam site.

C. M. Thomas produced crushed basalt for road use, and the State highway department and the United States Army Corps of Engineers contracted for roadstone and riprap, respectively. The Rainbow Rock Co. (D. G. Madden & R. O. Burke) quarried a varicolored volcanic tuff from the Rainbow Rock quarry near Maupin. The quarried material was split into blocks and marketed as a decorative building stone.

**Washington.**—Principal nonmetals produced were sand and gravel, stone, and clays. Two companies supplied paving, road, and building gravels and a small quantity of building sand, and the State highway department contracted for road and paving gravels. E. C. Hall Co., using a portable plant, produced crushed stone for highway construction. County road crews crushed basalt for roadstone and riprap, and the State highway department contracted for a small quantity of basalt for road maintenance. Scholls Tile Co., Hillsboro, and O. K. Brickyard, Sherwood, mined clay for use in draintile and building bricks, respectively; production was substantially the same as in 1955. Northwest Aggregates, Inc., operated a shale pit and expanding plant near Banks and produced expanded shale for use as lightweight aggregate. Smithwick Concrete Products Co. operated the Vernonia pit and shipped expanded-shale to the company aggregate plant at Portland, Multnomah County. Production of raw shale was slightly below that in 1955.

Digitized by Google

**Wheeler.**—A small quantity of gold and silver produced by E. O. Waterman from the Waterman placer in the Spanish Gulch district from April to November was the only mineral production reported in Wheeler County in 1956.

**Yamhill.**—Grand Island Sand & Gravel Co. (Dayton) produced sand and gravel for building and road use. Contractors supplied road-gravel requirements of State and county highway crews. O. C. Yokum and Amity Sand & Gravel Co. crushed stone for paving and road surfacing. The latter company also produced riprap. Three contractors supplied the State highway department with crushed stone for road use, and a fourth operator furnished a small quantity of riprap. McMinnville Brick & Tile Co. (McMinnville) and Willamina Clay Products Co. (Willamina) mined clay for heavy clay products.

Digitized by Google

# The Mineral Industry of Pennsylvania

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Pennsylvania Bureau of Topographic and Geologic Survey.**

By Robert D. Thomson [1] and Mary E. Otte [2]

PENNSYLVANIA mineral production in 1956 totaled $1 billion—an increase of $119 million (12 percent) over 1955. Of the 25 mineral commodities produced in 1956, 16 increased in value of output. In order of decreasing value, bituminous coal, anthracite, cement, stone, petroleum, natural gas, and clays were the more important economically. In 1956, 72 percent of the value of Penn-

**TABLE 1.—Mineral production in Pennsylvania, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Cement: | | | | |
| Portland.....376-pound barrels.. | 45,526,877 | $132,965,186 | 49,526,640 | $153,505,926 |
| Masonry.....do.... | 2,562,701 | 9,003,906 | 2,437,168 | 8,881,539 |
| Clays..... | 4,019,909 | 12,413,093 | [r] 4,412,550 | [r] 23,781,929 |
| Coal: | | | | |
| Anthracite..... | 26,204,554 | 206,096,662 | 28,900,220 | 236,785,062 |
| Bituminous..... | 85,713,456 | 440,451,700 | 90,286,692 | 479,437,406 |
| Cobalt (content of concentrate).....pounds.. | 478,840 | (3) | 533,329 | (3) |
| Gem stones..... | (4) | 60 | (4) | 100 |
| Gold (recoverable content of ores, etc.) troy ounces.. | 1,610 | 56,350 | (3) | (3) |
| Iron oxide pigment (crude)..... | 519 | 6,714 | 600 | 6,600 |
| Lime..... | 1,424,051 | 17,631,795 | 1,443,430 | 18,282,135 |
| Natural gas.....million cubic feet.. | 99,172 | 29,652,000 | 104,508 | 33,652,000 |
| Natural-gas liquids: | | | | |
| Natural gasoline.....thousand gallons.. | 4,305 | 281,000 | 4,081 | 251,000 |
| LP-gases.....do.... | 995 | 90,000 | 1,127 | 99,000 |
| Peat..... | 23,277 | 219,628 | 20,498 | 213,509 |
| Petroleum (crude)..thousand 42-gallon barrels.. | 8,531 | 80,200,000 | 8,230 | 85,718,000 |
| Sand and gravel..... | 13,312,971 | 20,511,847 | 14,047,068 | 21,320,981 |
| Silver (recoverable content of ores, etc.) troy ounces.. | 10,379 | 9,394 | (3) | (3) |
| Slate..... | 186,035 | 4,421,298 | 153,824 | 4,193,559 |
| Stone..... | 44,437,623 | [r] 68,918,111 | [e] 44,912,987 | [e] 78,830,720 |
| Sulfur (recoverable elemental sulfur)..long tons.. | 7,738 | 263,370 | 11,350 | 386,296 |
| Tripoli..... | [r] 1,090 | [r] 5,400 | 1,030 | 6,650 |
| Value of items that cannot be disclosed: Copper, iron ore, mica, oystershell (1956), pyrites, sericite, schist stone (dimension basalt 1956), and values indicated by footnote 3..... | ---------- | 15,819,073 | ---------- | 16,201,938 |
| Total Pennsylvania [7]..... | ---------- | [r] 969,910,000 | ---------- | 1,068,867,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers), except that fuels are strictly production.
[2] Excludes kaolin; value included with items that cannot be disclosed.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Weight not recorded.
[5] Final figure. Supersedes figure given in commodity chapter.
[6] Excludes certain stones, value for which is included with items that cannot be disclosed.
[7] The total has been adjusted to eliminate duplicating the value of clays and stone in manufacturing lime and cement.
[r] Revised figure.

[1] Acting chief, Division of Mineral Industries, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

sylvania's mineral output was attributable to fuels, 26 percent to nonmetals, and 2 percent to metals.

Production of one or more mineral commodities was reported in every county except Pike. Major producing counties (in order of decreasing value) were Washington, Luzerne, Northampton, Schuylkill, Cambria, Greene, and Allegheny. Washington County was the leading producer of bituminous coal, Luzerne of anthracite, Northampton of cement, Montgomery of stone, Clearfield of clays, Bucks of sand and gravel, and Centre of lime.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Anthracite.**—Anthracite output in Pennsylvania in 1956 increased 10 percent in tonnage and 15 percent in value over 1955. The average value per net ton increased from $7.86 in 1955 to $8.19 in 1956. Similar to the trend in 1955, the percentage of anthracite produced underground decreased from 55 percent to 52. Output from strip pits represented 29 percent of the total output, remaining approximately the same as in 1955. Production from culm banks and dredges totaled 19 percent compared with 15 in 1955.

Luzerne County again led in anthracite production, with 34 percent of the tonnage and 38 percent of the value. Producers in Luzerne and Schuylkill Counties supplied 65 percent of the total tonnage and 67 percent of the total value. Other productive counties were Carbon, Columbia, Dauphin, Lackawanna, Lancaster, Lebanon, Northampton, Northumberland, Snyder, and Sullivan. Berks County was the only county in which anthracite was produced in 1955 and not in 1956.

The fatality rate for the anthracite industry was slightly better in 1956. Fifty-six deaths were reported in 1956—7 percent lower than in 1955. Fatal and nonfatal injuries totaled 3,316 in 1956, compared with 3,090 in 1955. Injury rates in 1956 were 1.30 per million man-hours for fatal injuries and 75.80 per million man-hours for nonfatal injuries. Injury rates per million tons were 1.96 for fatal and 114.07 for nonfatal injuries. These injury rates were based on a total of 25,800 men working 43,010,000 man-hours to produce 28,578,000 short tons.

**Bituminous Coal.**—The production of bituminous coal in Pennsylvania—by far the most important single mineral commodity in the State (comprising 44 percent of the total State value)—increased 5 percent in tonnage and 9 percent in value compared with 1955. The average value per ton in 1956 was 17 cents greater than in 1955, totaling $5.31.

Bituminous coal was produced at underground, strip, and auger mines. In all, 997 underground mines, with a production of 1,000 tons or more, represented 74 percent of the total output. Of the total underground production, 97 percent was cut by machine, including the 26 percent mined by continuous miners, while the remainder was cut by hand or shot from the solid. Locomotives, shuttle cars, rope hoist, animals, and mother conveyors were used for underground haulage. Ninety-one percent of the underground output was loaded mechanically. Mobile loaders were the primary moving device—

Digitized by Google

loading into shuttle cars (67 percent), into mine cars (30 percent), and onto conveyors (3 percent). During the year there were in operation 478 shuttle cars, 254 mine cars, and 37 conveyors. Preparation plants active in 1956, totaled 140; they produced 50 million short tons of clean coal, of which 93 percent came from underground mines and 7 percent from strip mines. Of the total production mechanically cleaned, 89 percent was wet washed (15 percent by jigs and 74 percent by other wet methods) and 11 percent cleaned by pneumatic methods.

In all, 680 strip mines were active during the year producing 24 million short tons of coal. The average value per ton for strip mine coal was $3.90. In 1956 electric, diesel-electric, diesel, and gasoline power shovels and draglines were used. Of the 1,443 shovels and draglines in operation in 1956, 1,072 were power shovels, of which 1,002 had a capacity of less than 3 cubic yards, 63 of 3 to 5 cubic yards, 4 of 6 to 12 cubic yards, and 3 of over 12 cubic yards. The draglines totaled 371, of which 176 were less than 3 cubic yards capacity; 132, 3 to 5; 59, 6 to 12; and 4, over 12 cubic yards.

Less than 1 percent of Pennsylvania's bituminous-coal production came from 33 operating auger mines. The average price for coal produced from auger mines was $3.33.

In all, 52 fatal and 2,420 nonfatal injuries were reported for bituminous-coal mines operating in Pennsylvania in 1956. The injury rate for fatal injuries was 0.61 per million man-hours and 0.58 per million short tons, compared with 28.54 for nonfatal injuries and 27.10, respectively. The average number of men working in bituminous-coal mines in 1956 was 47,400 working 10,697,000 man-days or 84,790,000 man-hours to produce 89,300,000 short tons.

**Coke and Coal Chemicals.**—The work stoppage in the steel industry from July 1 to August 5 adversely affected coke-oven operations in Pennsylvania in 1956, with production increasing only 1 percent. However, Pennsylvania ranked first in quantity and total value for both beehive and oven coke produced in the United States, accounting for 27 percent of the output from slot-type ovens and 81 percent from beehive ovens. Fourteen plants, operating 3,976 slot-type ovens, carbonized 27,929,000 net tons of coal to produce 19,098,000 net tons of oven coke. A total of 3,203,000 net tons of coal was carbonized in 7,873 beehive ovens to produce 2,006,000 net tons of beehive coke. The average value for oven coke was $16.58 compared with $13.82 for beehive coke. Coke produced in Pennsylvania was shipped to blast-furnace plants, foundries, producer-gas plants, water-gas plants, other industrial plants, and for residential heating. Ninety-six percent of the coke was consumed at blast furnaces and 1 percent by foundries.

Over 289 billion cubic feet of coke-oven gas was produced in Pennsylvania coke ovens in 1956. Of this total, coke producers used 38 percent in heating the ovens, 4 percent under boilers, and 53 percent in steel or allied plants. Four percent of the gas was sold, and the remainder was waste gas. The 14 active plants produced 573 million pounds of ammonia as sulfate and 636,000 pounds as liquor. Also produced was 268 million gallons of coke-oven tar and 88 million gallons of crude light oil from which was made benzene, toluene, xylene, and solvent naphtha.

Digitized by Google

**Peat.**—Pennsylvania dropped from fifth to sixth place among the 17 peat-producing States in 1956, with a total yield of 20,000 short tons valued at $214,000. Output of peat in 1956 decreased 12 percent in tonnage and 3 percent in value below 1955. Varieties of peat produced were humus, moss, and reed sedge. Luzerne County ranked first in production, followed by Mercer and Erie Counties.

**Petroleum and Natural Gas.**—A total of 378 wells, exclusive of those drilled for gas storage and secondary-recovery purposes, was completed in Pennsylvania in 1956.[3]

Of these, 185 gas wells, 19 oil wells, and 47 dry holes were drilled in the shallow-sand belt of western Pennsylvania. In 1956, 127 deep wells (Middle Devonian or deeper) were completed; 81 of the deep wells were gas, and 46 were dry holes.

The 185 new shallow-sand gas wells had an initial open-flow capacity of 86,913 million cubic feet per day, compared with a capacity of 53,468 for the 214 gas wells completed in 1955. The 19 new shallow-sand oil wells completed in 1956 had a total initial production of 53.4 barrels per day as compared with an initial production of 80 barrels for the 17 new oil wells completed in 1955. The greatest activity in the shallow-sand gas belt occurred in Armstrong County, where 78 new wells (all gas) were completed; 64 of them were hydraulically fractured. In all 43 wells were completed in Jefferson County, 27 in Westmoreland, 23 in Indiana, 16 in each of Clarion and Forest, 14 in McKean, 9 in Washington, 6 in each of Allegheny and Butler, 5 in Fayette, 2 in each of Clearfield, Greene, and Potter, and 1 each in Elk and Erie.

Of the 143 deep sand wells drilled, 81 were gas wells, 46 dry holes, and 16 for gas storage. The most activity was in the Meade field and surrounding area in Erie County, where 35 gas wells and 17 dry holes were drilled. Five gas wells and three dry holes were drilled in the Glenlick pool of northeastern Clinton and adjacent southeastern Potter County. Four dry holes and 10 wells for gas storage also were drilled in Potter County. Drilling activity in Clearfield County was centered in 3 areas; 22 gas wells and 4 dry holes were drilled in the Rockton field, 6 gas wells and 1 dry hole in the Reed-Deemer field, and 1 wildcat well about 7 miles northeast of the Rockton field.

Most activity in Indiana County was in the Jacksonville field, where four gas wells were drilled. Two other gas wells were completed in this county, one in Armstrong Township and the other in Brush Valley Township. Drilling occurred in the southwestern corner of Jefferson County in the Reed-Deemer field, and a new dry hole was completed in Gaskill Township. In Elk County 1 gas well was completed in the Benezette-Driftwood field, and 4 gas wells and 2 dry holes were completed in the Hicks Run Pool area. The first wildcat well in southern Westmoreland County was completed, and production was begun in the St. Boniface Chapel Pool area. Drilling also occurred in 10 other counties, with 4 dry wells completed in Crawford, 2 in Bradford, and 1 each in Bedford, Centre, Lackawanna, Lawrence, McKean, Mercer, Snyder, and Tioga.

The proved recoverable crude-oil reserve in Pennsylvania was estimated at 132 million barrels as of January 1, 1957—8 million

[3] Lytle, W. S., Developments in Pennsylvania in 1956: Bull. Am. Assoc. Petrol. Geol., vol. 41, No. 6, June 1957, pp. 1010–1020.

Digitized by Google

**TABLE 2.—Natural-gasoline and cycling plants in 1956**

(Daily capacity in gallons)

| Company | Location | County | LP-gas mixture | Natural gasoline and other products | Total | Status | Type |
|---|---|---|---|---|---|---|---|
| Biery & Breene | Venus | Venango | | 80 | 80 | Operating | Complete. |
| Equitable Gas Co | Rogersville | Greene | | 10,000 | 10,000 | do | Absorption. |
| The Mars Co | Kane | McKean | | 2,000 | 2,000 | do | Do. |
| Do | Oil City | Venango | | 2,000 | 2,000 | do | Do. |
| Do | Van | do | 3,000 | 7,500 | 10,500 | do | Do. |
| Pennsylvania Gas Co | Sheffield | Warren | | 4,000 | 4,000 | do | Do. |
| The Peoples Natural Gas Co | Brave | Greene | | 20,000 | 20,000 | do | Do. |
| Quaker State Oil Refining Co | Noblestown | Allegheny | | 300 | 300 | do | Complete. |
| Do | do | do | | 700 | 700 | do | Do. |
| Waverly Oil Works Co | McDonald | Washington | | 533 | 533 | do | Do. |
| Do | do | do | | 733 | 733 | do | Do. |
| Total | | | 3,000 | 47,846 | 50,846 | | |

Digitized by Google

## TABLE 3.—Capacity of petroleum refineries and cracking plants in 1956

(Barrels per day)

| Company | Location | County | Type of plant | Crude oil capacity | | | Cracked gasoline capacity | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Operating | Shut down | Building | Operating | Shut down | Building |
| East: | | | | | | | | | |
| Atlantic Refining Co | Philadelphia | Philadelphia | Complete | 148,000 | | | 34,300 | | |
| Gulf Oil Corp | Girard Point | do | Skimming, cracking, and lube. | 183,000 | [1] 39,000 | | 48,840 | [1] 4,600 | 1,650 |
| Sinclair Refining Co | Marcus Hook | Delaware | Skimming and cracking | 102,000 | | 12,000 | 40,600 | | |
| Sun Oil Co | do | do | Complete | 145,000 | | | 58,100 | | |
| West: | | | | | | | | | |
| Franklin Refinery Division of L. Sonneborn Sons, Inc. | Franklin | Venango | Skimming and lube | 1,650 | | | | | |
| Kendall Refining Co | Bradford | McKean | Complete | 4,800 | | | 2,200 | | |
| Pennsylvania Refining Co | Karns City | Butler | Skimming and lube | 2,000 | | | | | |
| Pennzoil Division of South Penn Oil Co. | Rouseville | Venango | Complete | 10,000 | 3,000 | | 3,413 | [2] 2,068 | 1,995 |
| Quaker State Oil Refining Corp | Emlenton | do | do | 2,540 | | | 1,592 | | |
| Do | Farmers Valley | McKean | do | 4,000 | | | 2,500 | | |
| United Refining Co | Warren | Warren | do | 8,500 | [1] 1,500 | | 4,600 | | 2,500 |
| Valvoline Oil Co. Division of Ashland Oil & Refining Co. | Freedom | Beaver | Skimming and lube | 5,500 | | | | | |
| Wolf's Head Oil Refining Co., Inc | Reno | Venango | Complete | 2,500 | | | 1,460 | | |
| Total | | | | 619,490 | 43,500 | 12,000 | 197,605 | 6,668 | 6,145 |

[1] Equipment considered inoperable without extensive reconditioning.
[2] Includes 1,432 barrels daily considered inoperable.

Digitized by Google

barrels less than was reported for 1955. Gas producers in Pennsylvania estimated reserves of January 1, 1957, as totaling 760 billion cubic feet—6 billion feet greater than was reported on January 1, 1956.

**Natural-Gas Liquids.**—Natural-gas liquids were produced in Pennsylvania in 1956 with a 2-percent decrease in output from 1955. Eleven natural-gasoline and cycling plants were active in 1956, with a capacity (as of January 1, 1956) of 48,000 gallons a day for natural gasoline and other products and 3,000 for LP-gas mixture. Ninety-five percent of the capacity was designated as absorption and 5 percent as compression. Reserves of natural-gas liquids (includes condensate, natural gasoline, and liquefied petroleum gases), as of January 1, 1957, were estimated to total 3.1 million barrels—an increase of 76,000 barrels over that reported at the end of 1955.

Thirteen petroleum refineries were active in Pennsylvania in 1956, with an operating capacity of 619,000 barrels per day and an additional 44,000 barrels not in operation and 12,000 to be built during 1956. Capacity of plants for producing cracked gasoline in Pennsylvania, as of January 1, 1956, totaled 198,000 barrels per day operating, 7,000 shut down, and 6,000 to be built

## NONMETALS

**Cement.**—The cement industry in Pennsylvania in 1956 again set a new record, with shipments totaling 52 million barrels valued at $162 million. The industry followed a national trend and increased 8 percent in quantity and 14 percent in value over 1955. Demand was high during the year, and the cement industry continued expansion on the strength of the increasing demands by the construction industry for cement. Cement prices were increased by Pennsylvania producers on January 1 and October 1, with increases ranging from $0.15 to $0.25 a barrel.

Pennsylvania ranked first in the United States in the production of cements, with 16 percent of the total shipments of cement produced in 1956.

Seventeen companies were active in eight counties. A total of 24 plants produced portland cement in 1956, with 11 plants in Northampton County, 5 in Lehigh County, 2 each in Allegheny and Lawrence Counties, and 1 each in Berks, Butler, and York Counties. Lehigh and Northampton Counties continued to be the largest centers of production, supplying 67 percent of the portland-cement shipments in 1956. Capacity at the 24 plants was reported to be 53 million barrels—63 percent by the dry process and 37 percent by the wet process. The industry reported consuming 1.1 billion kilowatt-hours of electrical energy, of which 720 million kilowatt-hours was purchased from public-utility companies.

Of the plants producing portland cement, 21 also produced masonry cement.

**Clays.**—Industry established an alltime high in the production of fire clay and miscellaneous clay from Pennsylvania pits in 1956. Pennsylvania ranked second in the United States in the production of fire clay and sixth in miscellaneous clay. The output of fire clay in 1956 was 13 percent greater in tonnage and 75 percent greater in

Digitized by Google

**TABLE 4.—Shipments of portland cement, 1955–56, by counties**

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Barrels | Value | Barrels | Value |
| Lehigh | 8,005,405 | $23,098,410 | 8,700,326 | $26,513,074 |
| Northampton | 22,874,741 | 66,864,557 | 24,728,213 | 76,401,740 |
| Allegheny, Lawrence, Butler | 9,664,645 | 27,301,954 | 10,629,275 | 32,590,052 |
| Berks, Montgomery, York | 4,982,086 | 15,700,215 | 5,468,826 | 18,001,060 |
| Total | 45,526,877 | 132,965,136 | 49,526,640 | 153,506,926 |

value compared with 1955 and was 237,000 and $6.4 million greater than the previous high in 1951. Production of miscellaneous clay also increased, showing an 8-percent growth in tonnage and 202 percent in value (in certain instances value for processed clay was used). The 1956 production for miscellaneous clay was 20,000 tons and $3.6 million greater than the 1951 previous high. The increased output of the clay industry was due principally to increased demand for refractory materials by the steel industry, glass industry, and foundries and a greater use of clays in the production of cement, heavy clay products, and lightweight aggregate.

Fire clay was used principally in producing firebrick and block and heavy clay products, with smaller quantities used in producing miscellaneous refractories, art pottery, and flowerpots. The majority of the miscellaneous clay was used in producing heavy clay products and portland cement. Smaller quantities of miscellaneous clay were used in manufacturing art pottery, high-grade tile, refractories for foundry and steel works, lightweight aggregate, and filler for linoleum and paint.

**TABLE 5.—Clays sold or used by producers in 1955–56, by kinds and uses, in short tons**

| Use | Fire clay | | Miscellaneous clay | |
|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 |
| Refractories: | | | | |
| Bauxite, high-alumina brick | (1) | 8,463 | | |
| Firebrick and block | [2] 967,328 | 1,089,738 | | |
| Fire clay mortar | 29,811 | 27,631 | | |
| Foundries and steelworks | 118,086 | 136,753 | (1) | (1) |
| Miscellaneous refractories | 139,604 | 158,672 | | |
| Heavy clay products | 902,563 | 995,360 | 1,503,611 | 1,571,625 |
| Paint fillers or extenders | | | 380 | 360 |
| Lightweight aggregate | | | 117,308 | (1) |
| Cement | [3] 29,521 | | 170,478 | 204,668 |
| Undistributed | [3] 12,375 | [3] 26,369 | [4] 28,844 | [4] 192,911 |
| Total | 2,199,288 | [5] 2,442,986 | 1,820,621 | 1,969,564 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes kaolin.
[3] Includes fire clay for art pottery and stoneware, high-alumina brick, and glass refractories.
[4] Includes miscellaneous clay for art pottery and stoneware, high-grade tile, foundries and steelworks, linoleum and oilcloth, miscellaneous filler, lightweight aggregate, and other uses.
[5] Incomplete total, excludes kaolin.

Digitized by Google

**TABLE 6.—Clays sold or used by producers in 1956, by counties**

| County | Short tons | Value | Types of clay |
|---|---|---|---|
| Adams | 68,100 | $34,050 | Miscellaneous clay. |
| Allegheny | 145,860 | (1) | Do. |
| Armstrong | 227,962 | 2,621,549 | Fire clay. |
| Beaver | 630,375 | 2,395,042 | Fire clay, miscellaneous clay. |
| Blair | 19,796 | 176,688 | Do. |
| Butler | 19,809 | (1) | Do. |
| Cambria | 69,109 | 582,283 | Do. |
| Centre | 96,866 | 976,741 | Fire clay. |
| Chester | 58,241 | (1) | Miscellaneous clay. |
| Clarion | 126,979 | 1,316,686 | Fire clay, miscellaneous clay. |
| Clearfield | 630,209 | 5,589,316 | Do. |
| Clinton | 30,779 | 193,604 | Do. |
| Columbia | 14,800 | (1) | Miscellaneous clay. |
| Fayette | 169,832 | 1,401,025 | Fire clay, miscellaneous clay. |
| Greene | 4,062 | (1) | Miscellaneous clay. |
| Indiana | 34,139 | 153,625 | Fire clay. |
| Luzerne | 49,905 | 49,905 | Miscellaneous clay. |
| Lycoming | 360 | 6,455 | Do. |
| Montgomery | 78,672 | 106,186 | Fire clay, miscellaneous clay. |
| Schuylkill | 104,711 | (1) | Miscellaneous clay. |
| Washington | 52,938 | 69,813 | Do. |
| Westmoreland | 25,427 | (1) | Fire clay, miscellaneous clay. |
| Undistributed [2] | 1,753,619 | 8,108,961 | |
| Total [3] | 4,412,550 | 23,781,929 | |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes tonnage and value for counties that must be concealed as indicated by footnote 1 and for the following counties: Berks, Bucks, Carbon, Dauphin, Elk, Huntingdon, Jefferson, Lancaster, Lawrence, McKean, Northumberland, Snyder, Somerset, and York.
[3] Incomplete total; excludes kaolin.

Kaolin was used in producing portland cement and firebrick and block, with use in producing cements being more important.

**Lime.**—Production of lime in 1956 continued to increase, gaining 1 percent in quantity and 4 percent in value. This rise in Pennsylvania was due largely to the increased demand for lime for use in the chemical and industrial industries and as refractory material. The sale of lime for agricultural and building purposes declined during the year. Of the 19 lime-producing counties in the State, Centre County continued to lead (producing one-half of the total value of lime for the State), with Chester, Lancaster, Lebanon, Montgomery, and York Counties having an output of over $1 million each. Of the total lime sold or used, 80 percent was in the form of quicklime and dead-burned dolomite and 20 percent in hydrated form.

**Mica.**—Output of mica increased in 1956 in both tonnage and value compared with 1955. The mica was mined and processed near Glenville and marketed as ground mica for use in manufacturing paints and rubber and as a coating on welding rods.

**Nitrogen Compounds.**—Two atmospheric nitrogen (anhydrous ammonia) plants were in production in Pennsylvania in 1956. Both plants used byproduct hydrogen from petroleum refining to produce synthetic anhydrous ammonia. The Atlantic Refining Co. operated a plant at Point Breeze (Philadelphia County), having a daily capacity of 100 tons of ammonia. The Sun Oil Co. began operations in February at its Marcus Hook plant. Daily production of ammonia was 300 tons per day. In mid-April the plant was closed by an explosion, and it was estimated that repairs would take 6 months.[4]

[4] Oil Paint and Drug Reporter, Anhydrous Ammonia Unit Explodes at Marcus Hook: Vol. 169, No. 17, Apr. 23, 1956, p. 5.

Digitized by Google

TABLE 7.—Lime sold by producers, 1947–51 (average) and 1952–56, by uses

| Year | Agricultural | | Building | | Chemical and industrial | | Refractory | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 134,697 | $1,467,807 | 113,840 | $1,553,032 | 813,460 | $8,638,222 | (1) | (1) | 1,061,997 | $11,659,061 |
| 1952 | 131,007 | 1,463,596 | 123,049 | 1,675,987 | 768,319 | 8,228,875 | 180,606 | $2,473,755 | 1,202,981 | 13,842,213 |
| 1953 | 116,863 | 1,367,594 | 114,839 | 1,575,337 | 865,747 | 9,766,852 | 237,851 | 3,300,281 | 1,335,300 | 16,010,114 |
| 1954 | 129,146 | 1,537,849 | 120,661 | 1,697,895 | 816,044 | 9,753,519 | 15,732 | 217,047 | 1,081,583 | 13,206,310 |
| 1955 | 118,274 | 1,430,454 | 118,727 | 1,529,627 | 1,083,043 | 13,178,612 | 104,007 | 1,493,101 | 1,424,051 | 17,631,795 |
| 1956 | 229,348 | 3,156,710 | 110,344 | 1,456,088 | 1,103,738 | 13,669,337 | (2) | (2) | 1,443,430 | 18,282,135 |

[1] Refractory lime included with "Chemical and industrial."
[2] Refractory lime included with "Agricultural."

Digitized by Google

TABLE 8.—Lime sold or used by producers, 1955–56, by counties

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Armstrong | 788 | $3,846 | 884 | $10,185 |
| Bedford | 3,991 | 57,170 | (1) | (1) |
| Blair | | | 192 | 1,638 |
| Dauphin | | | 70,893 | 686,491 |
| Franklin | 2,513 | 21,987 | 2,305 | 20,745 |
| Lebanon | 244,111 | 2,749,585 | 165,418 | 1,737,841 |
| Lycoming | 800 | 6,400 | 1,400 | 11,200 |
| Montgomery | 74,079 | 1,150,083 | 71,782 | 1,077,063 |
| Montour | | | 60 | 378 |
| Northumberland | 550 | 4,276 | 485 | 4,000 |
| Snyder | 2,593 | 18,593 | 1,959 | 13,844 |
| Somerset | 1,563 | 9,378 | | |
| York | (1) | (1) | 142,424 | 2,136,327 |
| Undistributed [2] | 1,093,063 | 13,605,477 | 985,628 | 12,582,423 |
| Total | 1,424,051 | 17,631,795 | 1,443,430 | 18,282,135 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes tonnage and value for counties that must be concealed as indicated by footnote 1 and for the following counties: Butler, Centre, Chester, Fulton (1956), Juniata (1956), Lancaster, and Mifflin.

**Pyrite.**—A smaller quantity of pyrite was produced in 1956 by the Bethlehem Steel Co. at Cornwall (Lebanon County). The pyrite concentrate produced at the Lebanon Concentrator was shipped to Wilmington (Del.), where cobalt was recovered and pyrite sinter produced.

**Pyrophyllite (Sericite Schist).**—Output of sericite schist in 1956 increased in both tonnage and value. Output came from the open-pit mine operated by Summit Mining Corp. in Adams County. The sericite schist, after processing, was used as a carrier in insecticide chemicals, as a filler in asphaltic compounds, and in joint-filler cements. The company installed a new Hardinge disk mill, completing the construction on October 1, thus giving the company two mills.

**Roofing Granules.**—Two plants were operated by The Funkhouser Co. for the production of roofing granules. A plant at Delta (York County) produced roofing granules and flour from slate quarried nearby. A second plant at Charmian in Adams County, processed basalt into roofing granules and stone flour. A portion of the granules and flour produced at the Delta plant was exported.

**Sand and Gravel.**—The Pennsylvania sand and gravel industry overcame the decline that occurred in 1955 and showed a 6-percent increase in tonnage and 4-percent rise in value. Increased demand for sand and gravel as construction and building materials and use in State highways stimulated the growth of the industry in 1956.

Sand was sold for nine major uses, of which glass sand, paving sand, fire or furnace sand, and ground sand increased in the quantities sold or used. Molding-, building-, grinding-, and engine-sand sales decreased. Sand for use in blasting and filtering was not sold in 1956.

Gravel was used for four major applications, of which building, paving, and railroad ballast increased in tonnage.

In 1956 both sand and gravel was produced for use by Government agencies, while in 1955 only gravel was produced. Overall demand for sand and gravel was good in 1956, but wages and cost of supplies



Digitized by Google

increased, while value per ton decreased. In certain sections of the State, particularly the northeast, State highway construction of the turnpike resulted in increased demand, while in other areas demand was lower due to a slight decrease in the building activity. The average selling price for sand increased $0.13 per ton for fire sand to $0.90 for grinding sand and as high as $1.59 for ground sand. However, building sand decreased $0.11 per ton and paving sand $0.18. The average value for railroad gravel increased $0.09, while building gravel decreased $0.04 and paving gravel $0.14.

Commercial production of sand and gravel was reported in 41 counties in 1956. Bucks, Armstrong, and Lycoming Counties were the principal producing areas for commercial sand and gravel. Government-and-contractor production was reported in Lawrence, Monroe, and Philadelphia Counties. A total of 99 percent of the commercial production of sand and gravel was washed or otherwise processed before marketing. Of the commercial sand production, 24 percent was transported by railroads and 47 percent by trucks. About 11 percent of the gravel was transported by railroads and 47 percent by trucks.

**Slate.**—The slate industry in Pennsylvania in 1956 ranked first in the United States in total value of production and third in total tonnage, representing 24 percent of the Nation's tonnage and 36 percent of the total value. Production in Pennsylvania followed the national trend in 1956, decreasing 17 percent in tonnage and 5 percent in value. The market for electrical slate, roofing slate, and slate granules dropped substantially during 1956, and there was also a slight

**TABLE 9.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| COMMERCIAL OPERATIONS | | | | |
| Sand: | | | | |
| Molding and fire or furnace | 521,044 | $1,233,081 | (1) | (1) |
| Building | 3,823,809 | 5,094,580 | 3,817,152 | $4,660,080 |
| Paving | 2,073,476 | 2,850,744 | 2,245,280 | 2,990,176 |
| Engine | 127,148 | 302,837 | (1) | (1) |
| Filter | 420 | 1,260 | | |
| Other [2] | 1,001,339 | 3,111,164 | 1,827,094 | 5,628,849 |
| Total sand | 7,547,236 | 12,593,666 | 7,889,526 | 13,279,085 |
| Gravel: | | | | |
| Building | 3,659,166 | 5,093,197 | 4,039,259 | 5,471,300 |
| Paving | 1,823,028 | 2,529,653 | 1,934,265 | 2,413,949 |
| Railroad ballast | 79,988 | 51,981 | 103,163 | 76,579 |
| Other | 131,663 | 200,942 | 57,605 | 35,228 |
| Total gravel | 5,693,845 | 7,875,773 | 6,134,292 | 7,997,256 |
| Total sand and gravel | 13,241,081 | 20,469,439 | 14,023,818 | 21,276,341 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | |
| Sand: Paving | | | 9,300 | 16,740 |
| Gravel: Paving | 71,890 | 42,408 | 13,950 | 27,900 |
| Total sand and gravel | 71,890 | 42,408 | 23,250 | 44,640 |
| Grand total | 13,312,971 | 20,511,847 | 14,047,068 | 21,320,981 |

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Includes glass, grinding and polishing, blast, other uses and ground sand.

Digitized by Google

**TABLE 10.—Sand and gravel sold or used by producers, 1955–56, by counties**

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Armstrong | (1) | (1) | 1,339,083 | $2,436,281 |
| Beaver | 472,848 | $699,133 | 437,872 | 453,279 |
| Bedford | 9,644 | 22,953 | 10,770 | 25,525 |
| Bucks | 5,173,952 | 7,529,929 | 4,585,135 | 5,705,980 |
| Butler | 104,987 | 138,982 | (1) | (1) |
| Cambria | | | 8,500 | 10,500 |
| Carbon | 267,971 | 392,907 | 269,593 | 389,859 |
| Crawford | 117,249 | 126,768 | 134,535 | 160,505 |
| Cumberland | (1) | (1) | 92,195 | 136,188 |
| Dauphin | 97,192 | 95,032 | 44,577 | 42,374 |
| Elk | 40,235 | 24,338 | | |
| Erie | 172,070 | 208,769 | 130,312 | 168,459 |
| Fayette | 260,000 | 656,000 | 190,457 | 446,804 |
| Forest | 61,035 | 79,805 | 103,050 | 150,977 |
| Franklin | 153,955 | 224,390 | 143,198 | 209,542 |
| Luzerne | 362,561 | 428,530 | 468,763 | 554,573 |
| Lycoming | 833,023 | 608,260 | 847,649 | 630,090 |
| Mercer | 223,973 | 360,864 | 267,217 | 381,092 |
| Monroe | 38,512 | 54,433 | 205,942 | 330,338 |
| Montgomery | 10,000 | 25,060 | 11,000 | 26,050 |
| Northampton | 281,173 | 336,157 | (1) | (1) |
| Northumberland | (1) | (1) | 8,014 | 9,900 |
| Philadelphia | 599,200 | 339,747 | 625,325 | 429,412 |
| Schuylkill | 165,723 | 382,538 | 215,768 | 545,487 |
| Somerset | 2,292 | 6,694 | (1) | (1) |
| Wayne | (1) | (1) | 40,142 | 60,060 |
| York | 65,561 | 104,689 | (1) | (1) |
| Undistributed [2] | 3,799,815 | 7,665,869 | 3,872,971 | 8,017,757 |
| Total | 13,312,971 | 20,511,847 | 14,047,068 | 21,320,981 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes tonnage and value for counties that must be concealed as indicated by footnote 1 and for the following counties: Allegheny, Berks, Blair, Bradford, Chester (1956), Clearfield, Columbia, Huntingdon, Lancaster, Lawrence, McKean, Mifflin, Venango, Warren, Westmoreland (1955), and Wyoming.

decrease in the use of slate as flagging stone. Demand for structural and sanitary slate, blackboard slate, school slates, and slate flour increased sharply, with a slight increase in the use of slate for billiard tables. No slate was reported sold for making grave vaults and covers in 1956.

Employees of the Capital Slate Co., Inc. (East Bangor), were on strike from June to October. No other strikes were reported; however, various companies reported increased wages. Quarries were operated in 1956 in Lehigh, Northampton, and York Counties; Northampton County supplied 79 percent of the value of production. Sixteen operators were active in producing slate in 1956—14 in Northampton County and 1 each in Lehigh and York Counties.

**Stone.**—Production of stone in Pennsylvania in 1956 increased 1 percent in tonnage and 7 percent in value compared with 1955. Sandstone, granite, basalt, limestone, and miscellaneous stone were produced in 45 of the 67 counties; of the total value, sandstone represented 10, basalt 8, and limestone 81 percent.

Sandstone was marketed as both dimension and crushed stone, showing a combined total increase of 26 percent in tonnage and 71 percent in value compared with 1955. Higher material, wage, and labor costs, contributed to the large increase in selling price. About 64 percent more dimension sandstone was produced and marketed in Pennsylvania at a 37-percent increase in selling price. Dimension sandstone was prepared as rough construction, rubble, rough archi-

Digitized by Google

tectural, dressed, and curbing and flagging stone. All use categories except dressed stone increased in both tonnage and value over 1955. Increased use of concrete and concrete blocks for outside facings had some effect on the demand for dressed stone.

Crushed sandstone was prepared and sold as riprap, concrete aggregate, roadstone, railroad ballast, and refractory material and for other uses. Crushed sandstone for use as concrete aggregate, road material, and refractory material was the only crushed stone for which increases were reported in 1956. Demand for ganister rock for making silica brick and furnace linings was down during July and August because of the steel strike but quickly regained its usual status. In certain areas slag has become a material competitive to sandstone used as concrete aggregate and roadstone.

As in 1955, only dimension granite was sold from the granite processed in Pennsylvania. In 1956, it decreased 20 percent in tonnage and increased 15 percent in value. The granite was utilized as building stone and memorial stone and for granite surface plates. One quarry each in Bucks, Delaware, and Montgomery Counties was active in 1956.

Basalt decreased in tonnage in 1956 compared with 1955. Both dimension and crushed basalt was marketed in 1956. Crushed basalt decreased 5 percent in tonnage but increased 10 percent in value. Demand was greater in 1956 than in 1955 for all use categories except for road material and railroad ballast. The increased value was attributed principally to the higher cost of material and labor, thus requiring a higher selling price. Dimension basalt was marketed as stone for rough construction, and the crushed stone was marketed as riprap, concrete aggregate or roadstone, and railroad ballast and for other miscellaneous uses, principally roofing granules. Basalt was produced from quarries in Adams, Berks, Bucks, Chester, Delaware, and Montgomery Counties, with Delaware County being the principal area for basalt production.

The output of dimension limestone in 1956 decreased 41 percent in production and 45 percent in value, compared with 1955. The stone was produced in Bucks, Chester, and Lancaster Counties and used as rubble and rough construction stone.

Crushed limestone increased 0.5 percent in tonnage (223,078 short tons) and 3 percent ($1,507,053 value) in value. The limestone was used as concrete aggregate, fluxing agent, riprap, and railroad ballast and for agricultural purposes and miscellaneous uses. Limestone as riprap, concrete aggregate, and soil conditioner increased in tonnage and value. Despite the work stoppage in the steel industry, use of limestone as flux decreased only 6 percent in tonnage and 2 percent in value. Overall, increases in wages and in the resultant selling prices contributed to the increased value of production.

Miscellaneous stone was produced from quarries in Pennsylvania and processed and marketed as both dimension and crushed stone. Output of the dimension-stone industry decreased in both tonnage and value; the decrease in rough construction material caused a decrease in tonnage. The decreased value of curbing and flagging stone contributed substantially to the drop in total value. Both tonnage and value for crushed miscellaneous stone increased more

Digitized by Google

## TABLE 11.—Stone sold or used by producers, 1955–56, by uses

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| **Dimension stone:** | | | | |
| Building stone | 224,232 | $912,635 | 172,413 | $1,114,847 |
| Monumental stone | 378 | 55,325 | 168 | 24,115 |
| Curbing and flagging | 13,711 | 292,859 | (1) | (1) |
| Total dimension stone | 238,321 | 1,260,819 | 172,581 | 1,138,962 |
| **Crushed and broken stone:** | | | | |
| Riprap | 85,752 | 144,754 | 262,089 | 382,834 |
| Concrete, road stone, and railroad ballast | 15,575,172 | 23,314,077 | 17,502,458 | 26,668,680 |
| Furnace flux (limestone) | 9,950,775 | 16,714,426 | 9,365,869 | 16,314,675 |
| Refractory | 334,908 | 2,019,891 | 367,700 | 4,122,215 |
| Agricultural | 712,029 | 2,300,887 | 759,365 | 2,610,549 |
| Other uses | 17,540,666 | [2] 23,163,257 | 16,482,925 | 22,592,805 |
| Total crushed and broken stone | 44,199,302 | [2] 67,657,292 | 44,740,406 | 72,691,758 |
| Grand total | 44,437,623 | [2] 68,918,111 | [3] 44,912,987 | [3] 73,830,720 |

[1] Included with "Building stone" to avoid disclosing individual company confidential data.
[2] Revised figure.
[3] Excludes dimension basalt.

## TABLE 12.—Stone sold or used, 1955–56, by counties

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Allegheny | (1) | (1) | 9,280 | $31,442 |
| Bedford | 23,865 | $62,390 | (1) | (1) |
| Berks | 2,414,747 | 3,146,268 | 2,192,384 | 2,832,145 |
| Blair | 536,805 | 1,068,855 | (1) | (1) |
| Bucks | 697,483 | 1,269,313 | 745,468 | 1,370,960 |
| Butler | 2,452,797 | 4,443,739 | (1) | (1) |
| Cambria | 5,000 | 13,750 | | |
| Centre | 2,223,352 | 3,786,956 | 2,148,594 | 3,641,169 |
| Chester | 1,389,214 | 2,171,530 | 2,059,717 | 3,139,266 |
| Clinton | 151,958 | 213,492 | 158,134 | 236,808 |
| Cumberland | 531,810 | 914,671 | 594,146 | 1,013,487 |
| Dauphin | 1,342,482 | 2,149,426 | 1,351,944 | 2,298,394 |
| Fayette | 324,181 | 769,751 | (1) | (1) |
| Franklin | 380,997 | 605,035 | 439,426 | 702,703 |
| Fulton | 65,428 | 85,924 | 100,312 | 152,847 |
| Huntingdon | 349,045 | 1,304,607 | (1) | (1) |
| Indiana | 2,200 | 9,900 | 1,810 | 8,145 |
| Juniata | 89,616 | 286,502 | (1) | (1) |
| Lancaster | 1,717,028 | 2,747,208 | 1,827,280 | 3,005,250 |
| Lawrence | 3,273,959 | 5,338,034 | 3,287,899 | 5,561,574 |
| Lebanon | 2,445,651 | 3,859,376 | (1) | (1) |
| Lehigh | 2,760,563 | 3,014,849 | 2,362,481 | 2,384,814 |
| Lycoming | 315,936 | 558,830 | 357,682 | 583,092 |
| Mercer | (1) | (1) | 500 | 2,500 |
| Montgomery | 5,168,336 | 8,219,101 | 4,689,348 | 7,770,243 |
| Montour | 393,350 | 536,821 | (1) | (1) |
| Northampton | 6,880,654 | 6,891,767 | 6,066,925 | 5,540,291 |
| Perry | 17,917 | 32,447 | 46,943 | 94,353 |
| Potter | 7,438 | 171,761 | (1) | (1) |
| Schuylkill | 11,376 | 17,064 | (1) | (1) |
| Snyder | 79,703 | 131,866 | (1) | (1) |
| Susquehanna | 3,414 | 59,238 | (1) | (1) |
| Union | 181,900 | 308,650 | (1) | (1) |
| Washington | 4,884 | 34,150 | | |
| Wayne | 116,515 | 186,424 | 131,592 | 239,698 |
| York | 2,348,211 | 4,159,418 | 2,363,575 | 4,016,227 |
| Undistributed [2] | 5,729,808 | [3] 10,348,998 | 13,977,547 | 29,204,712 |
| Total | 44,437,623 | [3] 68,918,111 | [4] 44,912,987 | [4] 73,830,720 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes tonnage and value for counties as indicated by footnote 1 and the following counties: Adams, Armstrong, Carbon (1956), Delaware, Luzerne, Mifflin, Monroe, Northumberland, Philadelphia (1955), Somerset, Westmoreland, and Wyoming (1956).
[3] Revised figure.
[4] Incomplete total; excludes certain stones to avoid disclosing individual company confidential data.

Digitized by Google

than 100 percent, principally because of the increased demand for this material as concrete aggregate and road material. Producers of miscellaneous stone were active in Bucks, Lycoming, Montgomery, Potter, and Westmoreland Counties. Compared with the 1955 production locations, miscellaneous stone was produced also in Fayette County but not in Lycoming or Westmoreland Counties.

**Sulfur.**—Output of byproduct sulfur increased both in tonnage and value in 1956 with Pennsylvania ranking fifth in the nation. The elemental sulfur was recovered at the Sinclair Refining Co. Marcus Hook refinery as brimstone.

**Tripoli.**—Pennsylvania was 1 of the 3 States producing tripoli in 1956 ranking third, with a production of 1,000 tons. The output of rottenstone decreased slightly whereas value increased 23 percent. The ground material was used as an abrasive in such compounds as buffing compounds, metal polish, and cleaning and scouring soaps and as a filler.

## METALS

**Iron Ore.**—Iron-ore production in Pennsylvania in 1956 was retarded by a steel strike from July 1 to August 5. All the iron ore was produced at the underground Cornwall mine and shipped by rail to the Lebanon concentrator. Magnetite, copper pyrite, and iron pyrite in the ore were recovered at the Lebanon beneficiation plant, where iron concentrate, copper concentrate, and pyrite concentrate were produced. The copper concentrate was transferred primarily to a smelter at Laurel Hill, N. Y., for recovering copper, gold, and silver. The pyrite concentrate was processed further to recover cobalt and pyrite sinter. Underground development at the Cornwall mine in 1956 consisted of extending the incline shaft 2,100 feet, advancing 5,000 feet of drift and 1,500 feet of tunnel, and diamond drilling 52,500 feet. All of the iron ore was used for pig iron and steel.

Construction was begun by Dravo Corp. on the Nation's largest sintering plant at Saxonburg, Pa. The multimillion-dollar facility was being built for United States Steel Corp. The initial capacity for the sintering plant was to exceed 15,000 tons of iron ore sintered a day. The Saxonburg plant just north of Pittsburgh will process iron ore shipped from the Mesabi range and from the United States Steel Corp. new mines in Venezuela. Each of the 3 sintering machines will be 8 feet 3 inches wide, 200 feet long, and about 50 feet high.[5]

The first shipment of nickel was made from National Lead Co. Crum Lynne (Pa.) refinery. This refinery was operated by National Lead Co. and produced metallic nickel under a government contract. Nickel oxide sinter from the Government-owned facility in Nicaro, Cuba, was used as a raw material. The nickel was sold for the production of stainless and other nickel bearing steels.[6]

**Pig Iron and Ferrous Scrap.**—Production of pig iron in Pennsylvania in 1956 totaled 20,450,000 net tons. Despite a decrease of 150,155 short tons of pig iron produced in 1956, consumption of scrap in making pig iron increased 458,482 short tons. In all, 38,207,026 net

---

[5] Blast Furnace and Steel Plant, Construction of Sintering Plants Started: Vol. 14, No. 8, August 1956, p. 948.

[6] Oil Paint and Drug Reporter, National Lead Ships First Nickel from Refinery at Crum Lynne, Pa.: Vol. 170, No. 10, Sept. 3, 1956, p. 5.

Digitized by Google

tons of metalliferous materials, 17,027,748 tons of coke, and 8,006,628 tons of flux were consumed in producing pig iron. Metalliferous materials consumed per ton of pig iron produced in 1956 totaled 1.853—slightly less than in 1955.

Consumption of pig iron and ferrous scrap in Pennsylvania in 1956 increased less than 1 percent (308,327 short tons) compared with 1955. Open-hearth furnaces continued to be the leading consumer of both pig iron and ferrous scrap, consuming 87 percent of the total pig iron used and 76 percent of the total scrap used.

**TABLE 13.—Consumption of pig iron and ferrous scrap in 1955–56, by type of furnace, in short tons**

| Type of furnace and raw material | 1955 | 1956 | Type of furnace and raw material | 1955 | 1956 |
|---|---|---|---|---|---|
| Open-hearth furnaces: | | | Air furnaces—Continued | | |
| Pig iron | 18,071,822 | 17,883,714 | Scrap | 151,105 | 163,476 |
| Scrap | 13,929,937 | 14,166,691 | Total | 203,507 | 218,288 |
| Total | 32,001,759 | 32,050,405 | Blast furnaces: | | |
| Bessemer converters: | | | Pig iron | | |
| Pig iron | 671,189 | 716,047 | Scrap | 1,450,662 | 1,532,895 |
| Scrap | 125,837 | 79,586 | Total | 1,450,662 | 1,532,895 |
| Total | 797,026 | 795,633 | Ferroalloy furnaces: | | |
| Electric steel furnaces: | | | Pig iron | | |
| Pig iron | 20,503 | 26,715 | Scrap | 276 | 334 |
| Scrap | 1,752,251 | 1,897,991 | Total | 276 | 334 |
| Total | 1,772,754 | 1,924,706 | Miscellaneous uses: | | |
| Cupola furnaces: | | | Pig iron | [1] 1,456,223 | 1,422,020 |
| Pig iron | 328,134 | 346,810 | Scrap | [2] 85,242 | [2] 99,552 |
| Scrap | 754,079 | 767,346 | Total | 1,541,465 | 1,521,572 |
| Total | 1,082,213 | 1,114,156 | Total Pennsylvania: | | |
| Air furnaces: | | | Pig iron | 20,600,273 | 20,450,118 |
| Pig iron | 52,402 | 54,812 | Scrap | 18,249,389 | 18,707,871 |
| | | | Total | 38,849,662 | 39,157,989 |

[1] Includes direct castings and small quantity used in crucible furnaces.
[2] Includes small quantity used in crucible furnaces.

## REVIEW BY COUNTIES

**Adams.**—The Hanover quarry operated by Bethlehem Limestone Co. west of Hanover in Adams County yielded limestone, which was crushed at the local plant for use as blast-furnace flux, road material, railroad ballast, agricultural purposes, and stone sand and for cement manufacture. Quantities of the crushed stone were sold under contract to nearby Government agencies. Basalt was produced by The Funkhouser Co. from an open quarry and underground mine east of Charmian in Adams County. Crushed basalt was sold for use as roofing granules and stone flour.

Sericite schist was produced by Summit Mining Corp. from an open pit near Bendersville, ground at its local mill, and sold for use as filler in asphalt products, insecticides, and joint cement.

Miscellaneous clay, used in manufacturing heavy clay products, was recovered from open-pit mines by Alwine Brick Co., New Oxford, and Gettysburg Drain Tile Works, Gettysburg.

Digitized by Google

**TABLE 14.—Value of mineral production in Pennsylvania, 1955–56, by counties [1] [2] [3]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adams | (4) | (4) | Stone, sericite schist, clays. |
| Allegheny | $58, 081, 078 | $64, 536, 756 | Coal, cement, clays, sand and gravel, stone. |
| Armstrong | 10, 197, 169 | 15, 915, 421 | Coal, clays, sand and gravel, stone, lime. |
| Beaver | 4, 225, 167 | 4, 687, 410 | Clays, coal, sand and gravel. |
| Bedford | 551, 195 | 2, 083, 765 | Stone, coal, lime, sand and gravel. |
| Berks | 8, 913, 688 | 9, 671, 278 | Cement, stone, clays, sand and gravel, oyster shell. |
| Blair | 2, 143, 001 | 2, 453, 437 | Stone, coal, clays, sand and gravel, lime. |
| Bradford | (4) | (4) | Sand and gravel, coal. |
| Bucks | 8, 821, 242 | 7, 120, 640 | Sand and gravel, stone, clays. |
| Butler | 15, 737, 558 | 16, 751, 886 | Coal, cement, stone, lime, sand and gravel, clays. |
| Cambria | 63, 592, 999 | 68, 839, 370 | Coal, clays, sand and gravel, crude iron oxide pigments. |
| Cameron | 335, 560 | (4) | Coal. |
| Carbon | 14, 576, 629 | 15, 866, 478 | Coal, stone, sand and gravel, clays. |
| Centre | 14, 266, 587 | 16, 623, 942 | Lime, coal, stone, clays. |
| Chester | 3, 439, 493 | 4, 635, 706 | Stone, lime, sand and gravel, clays. |
| Clarion | 8, 578, 848 | 14, 236, 105 | Coal, clays. |
| Clearfield | (4) | (4) | Coal, clays, sand and gravel. |
| Clinton | 2, 635, 528 | 2, 745, 587 | Coal, stone, clays. |
| Columbia | 6, 648, 621 | 6, 186, 419 | Coal, sand and gravel, clays. |
| Crawford | 126, 768 | 160, 505 | Sand and gravel. |
| Cumberland | (4) | 1, 149, 675 | Stone, sand and gravel. |
| Dauphin | 3, 038, 855 | 4, 641, 527 | Stone, coal, clays, sand and gravel, lime. |
| Delaware | (4) | (4) | Stone, sulfur. |
| Elk | (4) | (4) | Coal, clays. |
| Erie | (4) | (4) | Sand and gravel, peat. |
| Fayette | 41, 341, 340 | 35, 322, 678 | Coal, clays, stone, sand and gravel. |
| Forest | 79, 805 | 150, 977 | Sand and gravel. |
| Franklin | 844, 648 | 932, 990 | Stone, sand and gravel, lime. |
| Fulton | (4) | 399, 014 | Coal, stone, lime. |
| Greene | 65, 628, 367 | 68, 823, 643 | Coal, clays. |
| Huntingdon | 4, 315, 318 | 5, 848, 287 | Sand and gravel, stone, coal, clays. |
| Indiana | 28, 480, 723 | 36, 557, 072 | Coal, clays, stone. |
| Jefferson | (4) | (4) | Coal, clays. |
| Juniata | 286, 502 | 554, 045 | Stone, lime. |
| Lackawanna | 22, 017, 503 | 28, 612, 975 | Coal. |
| Lancaster | 5, 323, 416 | 6, 131, 612 | Stone, lime, coal, sand and gravel, clays. |
| Lawrence | 17, 474, 987 | 18, 978, 581 | Cement, stone, coal, clays, sand and gravel. |
| Lebanon | 20, 917, 678 | 20, 130, 548 | Iron ore, copper, stone, lime, cobalt, pyrite, gold, coal, silver. |
| Lehigh | 26, 604, 947 | (4) | Cement, stone, slate, oystershell. |
| Luzerne | 87, 818, 001 | 91, 793, 125 | Coal, stone, sand and gravel, peat, clays. |
| Lycoming | [5] 1, 411, 770 | 1, 493, 880 | Sand and gravel, stone, coal, lime, tripoli, clays. |
| McKean | 599, 095 | 820, 155 | Clays, coal, sand and gravel. |
| Mercer | 2, 859, 077 | 3, 015, 701 | Coal, sand and gravel, peat, stone. |
| Mifflin | (4) | (4) | Sand and gravel, stone, lime. |
| Monroe | (4) | (4) | Sand and gravel, stone. |
| Montgomery | 14, 501, 384 | (4) | Stone, cement, lime, clays, sand and gravel. |
| Montour | 536, 821 | (4) | Stone, lime. |
| Northampton | 73, 568, 907 | 83, 082, 046 | Cement, slate, stone, sand and gravel, coal. |
| Northumberland | 21, 418, 663 | 26, 593, 629 | Coal, clays, stone, sand and gravel, lime. |
| Perry | 32, 447 | 94, 353 | Stone. |
| Philadelphia | 368, 747 | 429, 412 | Sand and gravel. |
| Potter | 171, 761 | (4) | Stone. |
| Schuylkill | 53, 565, 714 | 69, 799, 731 | Coal, sand and gravel, stone, clays. |
| Snyder | 262, 133 | 388, 141 | Clays, stone, coal, lime. |
| Somerset | 15, 326, 200 | 22, 474, 172 | Coal, clays, stone, sand and gravel. |
| Sullivan | 63, 426 | 57, 042 | Coal. |
| Susquehanna | 59, 238 | (4) | Stone. |
| Tioga | 421, 032 | 486, 275 | Coal. |
| Union | 308, 650 | (4) | Stone. |
| Venango | (4) | (4) | Coal, sand and gravel. |
| Warren | (4) | (4) | Sand and gravel. |
| Washington | 94, 690, 663 | 95, 669, 087 | Coal, clays. |
| Wayne | (3) | 299, 757 | Stone, sand and gravel. |
| Westmoreland | 20, 377, 543 | 20, 937, 309 | Coal, stone, clays. |
| Wyoming | (4) | (4) | Sand and gravel, stone. |
| York | 11, 201, 555 | 12, 527, 337 | Cement, stone, lime, slate, clays, sand and gravel, mica. |
| Undistributed | [5] 111, 121, 721 | 178, 157, 713 | |
| Total | [5] 969, 910, 000 | 1, 088, 867, 000 | |

[1] Pike County is not listed, because no production was reported.
[2] Excludes value of production for LP-gases, natural gas, natural gasoline, and petroleum by counties, but value is included with "Undistributed."
[3] Excludes value of clays and stone used in the manufacture of lime and cement.
[4] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[5] Revised figure.

Digitized by Google

**Allegheny.**—The major portion of bituminous coal mined in Allegheny County in 1956 was from underground mines, with smaller quantities from strip and auger mines. Leading producers were: Allegheny-Pittsburgh Coal Co., William Aloe Coal Co., Butler Consolidated Coal Co., Campbell Coal Co., Duquesne Light Co., Greensburg-Connellsville Co., Harmar Coal Co., National Mines Corp., Pittsburgh Coal Co., and Republic Steel Corp.

Universal Atlas Cement Co., a subsidiary of United States Steel Corp., operated its cement plant at Universal, producing air-entrained and non-air-entrained Types I–II, portland-pozzolan, waterproof-portland, and mortar cements by the wet process. Pittsburgh Coke & Chemical Co., Green Bag Cement Division, produced cement from its plant at Neville Island. Portland-pozzolan and waterproof-portland cements were manufactured by the wet process.

Production of miscellaneous clay was utilized for manufacturing heavy clay products by Bridgeville Brick Co., Bridgeville; Van Ormer Brick Co., Inc., Pitcairn; M. Lanz Brick & Tile Co., Pittsburgh; Milliken Brick Co., Inc., Wilkinsburg; and Allegheny Brick Co., Creighton.

Sand & Gravel, Inc., operator of a dredge on the Allegheny River near Pittsburgh, recovered and processed building and paving sand and gravel. James H. McCrady, Jr. (Harmarville), produced and processed molding sand and a quantity of unwashed road sand. Keystone Sand & Gravel Co. (Pittsburgh) and Frank Bryan, Inc. (McKees Rocks), produced washed sand usable as building sand and sold the material to the United States Army Corps of Engineers (Pittsburgh) for use in repairing dams and locks.

Malli Mines (Jefferson Borough) produced miscellaneous irregular dimension sandstone for use in construction work, and Francis Matesia (Bridgeville) produced dimension sandstone for use as rubble.

Panacalite Perlite Co. (Pittsburgh) processed expanded perlite for use as plaster aggregate and Perlite Manufacturing Co. (Carnegie) for use as plaster and concrete aggregate and for miscellaneous industrial uses. Both companies purchased crude perlite from mines in Western United States.

**Armstrong.**—Production of bituminous coal reported in Armstrong County was mined from underground, strip, and auger mines. Leading producers were: Allegheny River Mining Co., B. & V. Coal Co., J. Russell Cravener Coal Co., Freebrook Corp., Hawk Bros. Contracting Co., Leechburgh Mining Co., M. & E. Coal Co., Inc., Powell Coal Co., Taylor Bros., and West Freedom Mining Co.

In terms of value, Armstrong County was the second leading clay-producing county in the State in 1956. Five operators of underground mines produced plastic fire clay used primarily for manufacturing refractories and heavy clay products and a smaller quantity of mortar. Producers were Kittanning Refractories, Inc., Continental Clay Products Co., and Haws Refractories Co., all at Kittanning; Kittanning Brick Co., Adrian; and Harbison-Walker Refractories Co., Pittsburgh. Freeport Brick Co. (Freeport) produced flint fire clay from an underground mine for use in manufacturing refractory firebrick and block. Worthington Ceramics Co. (Worthington), produced plastic fire clay from an open pit, which was sold for use in manufacturing heavy clay products, and Graff-Kittanning

Digitized by Google

Clay Products Co. (Worthington) produced plastic fire clay from an open pit for use at the local company plant for making sewer pipe and wall coping.

Sand and gravel recovered from a dredging operation along the Allegheny River near Ford City by J. K. Davison & Bro. was sold for use as construction and paving material. Glacial Sand & Gravel Co. (Cowansville) produced and marketed prepared building and paving sand and gravel and gravel for use as railroad ballast. Allegheny Sand & Loam Co. (Leechburg) produced sand and prepared it for use as fire or furnace sand, and Lee Don, Inc., Manorville Sand Division (Manorville), produced building sand and gravel and paving sand.

Michigan Limestone Division, United States Steel Corp., operated the Kaylor underground mine south of East Brady in Armstrong County, producing limestone for use as blast-furnace flux and road material, for agricultural purposes, and in manufacturing cement. A quantity of stone was sold to Government agencies as highway material. C. D. McCanna Plant crushed limestone produced from an underground mine at Kittanning, for use in making lime.

Hydrated lime, produced and marketed for agricultural purposes, was reported by C. D. McCanna Lime Plant, Walter Hershberger, and Robert E. Toy, all near Kittanning.

**Beaver.**—Beaver County ranked first in the State in 1956 in the production of clays. The leading producers of 13 reporting companies were: McLain Fire Brick Co., Division of H. K. Porter Co., Inc., Beaver; Eastvale Clay Products Co., Beaver Falls; Standard Clay Manufacturing Co., and Colonial Clay Products Co., both at Fallston; Ralph A. Veon, Inc., Darlington and New Galilee; Pen-Hio Clay Co., Cannelton; McQuiston Coal Co., Darlington; Negley Fire Clay Co. and New Castle Refractories Co., both at New Galilee; and Davis Coal Co., Beaver County, west of Negley, Ohio. Fire clay of the flint and burley type and miscellaneous clay were sold or used mainly for manufacturing heavy clay products, refractory firebrick and block, refractories for foundries, and use at steelworks. A quantity of the clay was used for the manufacture of art pottery, flower pots, glaze slip, and in pouring channels.

Ten leading producers of bituminous coal in Beaver County were: Oscar Brown, Colonial Gas Coal Co., Courtney Coal Co., Dow-Lin Coal Co., C. J. Lundy Mining Co., Negley Fire Clay Co., North Sewickley Coal Co., Sunnyside Coal Mining Co., Tasa Coal Co., and R. A. Veon. Underground, strip, and auger mines were operated in the county.

Beaver Sand Co. (Beaver) produced washed sand and gravel for construction use. Shippingport Sand & Gravel Co. operated a dredge and fixed plant near Shippingport, producing prepared sand and gravel for building and paving purposes.

**Bedford.**—New Enterprise Stone & Lime Co., Inc., operated a limestone quarry and crushed the stone at the Aschom plant (Everett) for use as road material. Quantities of crushed limestone also were sold to Government agencies as road material. Ganister rock sold or used for manufacturing silica brick and furnace or converter lining was quarried by Leap Ganister Rock Co. (Madley).

Digitized by Google

Leading producers of bituminous coal in Bedford County were: Ark Coal Co., Bunker Hill Coal Co., Fry Coal & Stone Co., Ellsworth Douglas, Helen Coal Co., Hickory Hill Coal Co., Kenneth G. Richards, Tenley Coal Co., Top Coal Co., and Ralph Wills. Coal was mined from underground and strip operations.

Quicklime was produced and sold for agricultural purposes by J. Mason Kerr, operator of the Gravel Pit Kilns near Hyndman. New Enterprise Stone & Lime Co., Inc., produced hydrated lime as agricultural, chemical, and industrial lime at it Aschom plant at Everett.

Feight Bros. (Everett) produced sand and washed it at a local preparation plant for use as building material.

**Berks.**—Allentown Portland Cement Co. operated quarries at Evansville and Oley, producing crushed limestone and cement rock utilized at the Evansville No. 1 plant for manufacturing portland cement (Types I–II, Type III, air-entrained, and non-air-entrained) and mortar cement.

Eastern Lime Corp. reported output of crushed limestone from the Hinterleiter quarry and crusher at Kutztown for road material and agricultural purposes. This company also began developing a new stone quarry and plant at Oley, to begin production in 1957. Crushed limestone, usable as road material and railroad ballast, was produced from a quarry by Berks Products Corp. (Reading). Some of the stone was sold to local Government agencies. E. J. Breneman, Inc., operated a quarry and plant at Sinking Spring, producing crushed limestone for road material, and sold a major portion under contract to local Government agencies. The John T. Dyer Quarry Co. operated 3 quarries—1 each at Monocacy, Birdsboro, and Robeson—producing crushed basalt for use as road material, railroad ballast, and riprap. Stowe Trap Rock Co. (Douglassville) produced crushed basalt for use as road material and railroad ballast.

Miscellaneous clay was produced by Glen-Gery Shale Brick Corp. from open-pit mines at Wyomissing and Shoemakersville, for use in manufacturing heavy clay products.

John H. Gring (Sinking Spring) produced building sand and gravel and paving gravel for use by local builders. Building sand and gravel was produced and sold by Schildt Bros. (Temple).

Reading Poultry Feed Co. (Reading) crushed oystershell for use as mineral food and poultry grit.

**Blair.**—Limestone was quarried, crushed, and sold primarily as road material by Chimney Rocks Lime & Stone Co., Hollidaysburg; Eldorado Stone Co., Altoona; and New Enterprise Stone & Lime Co., Inc., Roaring Spring and Hollidaysburg. Several producers marketed the limestone to local Government agencies for use as road material. Sproul Lime & Stone Co. (Claysburg) sold pulverized agricultural limestone. General Refractories Co. (Claysburg) and J. L. Hartman Co., operator of the Sara Furnace quarry (Sproul), produced and ground quartzite for making silica brick. Basalt Trap Rock Co. produced quartzite from its quarry at Williamsburg for use as railroad ballast, road material, and riprap.

Producers of bituminous coal in Blair County in 1956 were: Burkhart Coal Co., Cavalier Coal Co., Margaret Heston, Lawrence Sherbine, and Stone Bridge Coal Co. Both underground and strip mines were operated.

Digitized by Google

Kaolin, produced by Grannas Bros. from the No. 1 open-pit mine near Williamsburg, was sold for use in manufacturing fire brick and block. Miscellaneous clay was produced by Blair Clay Products, Inc. (Altoona) and used for making building brick. Woodbury Clay Co. (Williamsburg) produced and sold plastic fire clay for making mortar, and Harbison-Walker Refractories Co. (Oreminea) produced plastic fire clay for use in manufacturing firebrick and block.

General Refractories Co. (Frankstown) reported producing gravel as building material. Frankstown Sand Supply and George G. Trude (both at Frankstown) produced and sold washed sand for building purposes.

A quantity of hydrated lime for agricultural use was manufactured and sold by Chimney Rocks Lime & Stone Co. (Hollidaysburg).

**Bradford.**—Karl D. Shiner (Towanda, Wysox Township), the only producer of sand and gravel in Bradford County, reported output of sand and gravel washed and screened at a local processing plant for use as building and paving material. A small quantity of unwashed bank-run gravel was sold for miscellaneous uses.

Bituminous coal was mined from a strip mine by Paul Percival, the only producer of coal in Bradford County.

**Bucks.**—Bucks County continued to lead in sand and gravel production in the State in 1956 but showed a slight decrease in production and value compared with 1955. Eight companies reported production of sand and gravel, output of which was sold primarily for structural and paving material. Producers were: Amico Sand & Gravel Co., Fallsington; Durnan & Good and Frank Casilio & Sons, Upper Black Eddy; Warner Co., Van Sciver and Dredge Franklin plants, Silvi Sand & Gravel Co., and the Brennan Sand Co., Tullytown; Riegelsville Sand & Gravel Co., Riegelsville; and A. L. Lewis, New Hope.

Bituminous Service Co. (Buckingham) and New Hope Crushed Stone Lime Co. (New Hope), recovered limestone from quarries and crushed the stone at local plants for road material. New Hope Crushed Stone Lime Co. sold some of the material to Government agencies for local Government projects. Edward Karpinski produced dimension limestone for use as rubble, from the Karpinski quarry at Janney Station. Production of basalt from the Rock Hill quarry at Quakertown by The General Crushed Stone Co. was crushed for use as road material and railroad ballast. A quantity of road material was sold to various Government agencies. David D. Derstine, east of Telford in Bucks County, quarried and crushed basalt for road material.

Coopersburg Granite Co. produced dressed dimension granite from a quarry near Coopersburg, marketed under the trade name "American Premier Blue-Black Granite," for use as granite surface plates. Miscellaneous dimension stone as rough and dressed building stone, and crushed stone as road material was recovered from the Edison quarry, Edison, and crushed at the local plant by C. Bucciarelli & Sons. A. & L. Kauffman operated the Rushland quarry, Rushland; George Wiley, Wiley's quarry (blue stone), Point Pleasant; and Samuel M. Yoder Estate operated the Blooming Glen Stone Crushing Works and quarry at Blooming Glen. All produced crushed miscellaneous stone for road material.

Digitized by Google

Quakertown Brick & Tile Co., Inc. (Quakertown), reported output of miscellaneous clay for use in the manufacture of standard size building brick.

Hyzer & Lewellen (Southampton) imported crude vermiculite from Africa and processed the material at its exfoliating plant for use in manufacturing packaging acids, plaster, house insulation, and concrete.

**Butler.**—Production of bituminous coal in Butler County was mined by underground, strip, and auger methods. Leading producers were: Allison Engineering Co., Chutz Bros., Grove City Construction Co., Grubbs Construction Co., Kerry Coal Co., Miller & McKnight Coal Co., Sunbeam Coal Corp., Tri County Fuel Co., West Freedom Mining Co., and Winters & Evans.

Penn-Dixie Cement Corp. produced limestone from its underground mine at West Winfield and utilized the crushed stone at the No. 9 plant for the manufacture of cement. Portland cement of the non-air-entrained Types I–II and III, and masonry cement were produced and marketed by this company.

Grove City Limestone Co. recovered limestone from a quarry and crushed the stone at the local Branchton plant for road material and agricultural purposes. Michigan Limestone Division, United States Steel Corp., mined limestone from the Annandale underground mine and crushed the stone at Boyers for use as blast-furnace flux, road material, and railroad ballast and in manufacturing cement. Both companies sold road material to Government agencies.

Hydrated lime manufactured and sold for agricultural use, sewage treatment, and water purification and quicklime for use in open-hearth and electric furnaces, were produced by Mercer Lime & Stone Co., Inc., near Branchton.

Production of building sand and gravel, from a pit and fixed plant at Slippery Rock, was reported by H. W. Cooper. Harold M. Martsolf reported no production of sand and gravel in 1956, as he was erecting a new plant near Portersville (Muddy Creek Township).

D. B. Boosel operated an open-pit mine near Slippery Rock, producing plastic fire clay sold for use in manufacturing refractories; and Scott Borland mined miscellaneous clay from an open-pit mine at Mars, used for making heavy clay products.

**Cambria.**—The major portion of bituminous coal mined in Cambria County in 1956 was from underground mines, with smaller quantities from strip and auger mines. Some leading producers were: Barnes & Tucker Co., The Berwind White Coal Mining Co., Bethlehem Limestone Co., Bethlehem Steel Co., Bird Coal Co., Eastern Gas & Fuel Association (Coal Division), Johnstown Coal & Coke Co., Pennsylvania Coal & Coke (Penn Texas Division), Rich Hill Coal Mining Co., Sterling Coal Co., and Vinton Coal & Coke Co.

Triangle Clay Products Co. (Johnstown) produced miscellaneous clay from an open pit, and Patton Clay Manufacturing Co. (Patton) produced fire clay from an underground mine. Both companies used the clay for manufacturing heavy clay products. Hiram Swank's Sons, Inc., operated the Swank No. 24 underground mine at South Fork, producing flint fire clay used for manufacturing refractory sleeves, nozzles, and stoppers. The Blandburg Frick No. 2 underground mine near Dean, operated by Harbison-Walker Refractories

Digitized by Google

Co., yielded plastic fire clay used for manufacturing glass refractories.

Nicosia Stone Quarry produced a quantity of building sand and gravel from a pit and fixed plant at Johnstown.

Lanzendorfer Trucking Co. produced and marketed crude iron oxide pigments of the yellow sulfur mud variety from its No. 31 mine near Twin Rocks for use as paint pigments.

**Cameron.**—Bituminous coal, the only mineral commodity produced in Cameron County in 1956, was recovered from stripping operations by Rydesky Mines and by S. Brake Slyder.

**Carbon.**—A total of 10 companies reported production of anthracite in Carbon County in 1956. Producers were: A. R. Chamberlain Coal Co., Coaldale Mining Co., Inc., Glen Alden Corp., Gravine Coal Co., Jackson Coal Co., Lehigh Valley Coal Co., Panther Valley Coal Co., Spearhead Mining Co., Valley Stripping Corp., and Wat-Rap Coal Co. Underground mines, strip pits, and culm banks were operated in this county for anthracite.

North American Refractories Co., the only producer of stone in Carbon County, recovered ganister rock from the Little Gap quarry (Palmerton), crushing and using the stone in producing silica brick.

Alliance Sand Co. operated its pit and fixed plant near Palmerton, producing washed sand for use as building and paving material, fire or furnace sand, and engine sand. Butz Lumber Co. reported the output of washed sand, for use as building material, from a pit and fixed plant near Palmerton. Wagner Sand Co. produced building sand and paving sand and gravel from a pit east of Hazleton in Carbon County.

Panther Valley Coal Co., Inc. (Lansford), produced miscellaneous clay as a byproduct of anthracite mining and sold the clay for use in manufacturing lightweight aggregate.

**Centre.**—Three companies manufactured lime in Centre County. Standard Lime & Cement Co. (Pleasant Gap) produced only quicklime; National Gypsum Co. and Warner Co. (both of Bellefonte) produced both quicklime and hydrated lime. Primary uses of lime were for agricultural lime, various chemical and industrial limes, and as a building material.

Bituminous coal produced in Centre County was mined from underground and strip mines. Ten leading producers were: Robert Bailey, R. S. Carlin, Inc., Cherry Run Coal Mining Co., Inc., Elliot Coal Mining Co., H. & R. Coal Co., Morgan Coal Co., Penbrook Contracting Corp., River Hill Coal Co., Rice Bros. Coal Co., and C. J. Semple.

Limestone was recovered in 1956 in Centre County from 2 underground mines and 4 quarries. Limestone was produced from underground mines by Warner Co., Bellefonte Division, Bellefonte, and the crushed stone was marketed mainly as road material, railroad ballast, and dust for coal mines and for manufacturing lime and glass. Standard Lime & Cement Co. (Pleasant Gap) produced crushed limestone for use as stone sand and manufacturing lime. Limestone recovered from four quarries was sold or utilized primarily for road material and blast-furnace and open-hearth flux, by Whiterock Quarries, Pleasant Gap; National Gypsum Co., Bellefonte; Neidigh Bros. Limestone Co., Inc., State College; and Valley View Lime Co., Marion Township.

Digitized by Google

McFeely Brick Co. produced quartzite from its Port Matilda quarry and shipped the stone by railroad to its Latrobe plant for making silica brick. This firm sold its operation to General Refractories Co. (Philadelphia) in February 1956.

Harbison-Walker Refractories Co. operated the Blair open-pit mine, producing plastic fire clay. General Refractories Co. (Orviston) produced flint fire clay from an underground mine, and J. H. France Refractories Co. (Snow Shoe) produced flint fire clay from an open pit. The total production of the three companies was used for manufacturing refractory firebrick and block.

**Chester.**—W. E. Johnson, Inc., operated a quarry and crusher at Paoli, producing dimension limestone for use as rough construction stone and crushed limestone for road material. A quantity of road material was sold to local Government agencies. Warner Co. produced limestone from its Cedar Hollow quarry and crushed the stone at Devault, for use as blast-furnace flux, road material, agricultural purposes, and chemical uses and in manufacturing lime. Valley Forge Stone Co. (Malvern) produced crushed limestone from a quarry and crusher for use as blast furnace flux and road material. Bradford Hills Quarry, Inc., quarried limestone and crushed the stone at the Downingtown plant for use as road material, and sold some to local Government agencies.

Black diabase dimension stone recovered from a quarry at Saint Peters by French Creek Granite Co. was sold for use as building material. Basalt, quarried and crushed by Keystone Trappe Rock Co. (Cornog) and V. DiFrancesco & Sons (Devault), was sold primarily for use as road material and railroad ballast. Both companies sold stone as road material to various Government agencies. Dimension sandstone was quarried by Abram T. Minor from the Avon-Grove quarry, and Alfred V. Moulder, Avondale Colonial quarry, both at Avondale; and Albert Rotunno, Rotunno quarry, West Grove. The stone was sold or used by the producers as rough construction stone, rubble, building stone, and curbing and flagging stone.

The only producer of lime in Chester County was Warner Co. from its Cedar Hollow plant near Devault. Output of hydrated lime was sold principally as mason lime and quicklime for use as agricultural lime, in sewage treatment, and in manufacturing magnesite.

A. T. Harris Sand Co. operated a quarry and crusher at Honey Brook, producing ground sand for foundry uses.

Miscellaneous clay recovered from open pits by Phillip D. Cope (Lincoln University) was utilized for manufacturing flowerpots, and clays produced by McAvoy Vitrified Brick Co. (Phoenixville) were used for manufacturing common building brick.

**Clarion.**—Leading producers of bituminous coal in Clarion County were: Allison Engineering Co., H. N. McNutt Coal Co., Mac Coal Co., Mays Coal Co., E. M. Reed Contracting Co., Inc., Harold A. Siegel Coal Co., W. Pershing Stahlman Coal Co., Inc., W. P. Stahlman, G. I. Stiles & Co., and Zacherl Coal Co. Coal was mined from strip, underground, and auger mines.

Eight companies operated open-pit and underground clay mines, producing flint and plastic fire clay and miscellaneous clay, sold or used by producers for manufacturing refractory firebrick and block, mortar, and heavy clay products. Clay producers were: Niles Fire

Digitized by Google

Brick, Division Mexico Refractories Co., Lucinda Clay Co., Harbison-Walker Refractories Co., and J. F. Eiswerth Estate, all near Lucinda; New Bethlehem Tile Co., Climax Fire Brick Co., and Frank B. Pope Co., all at New Bethlehem; and McLain Fire Brick Co. (Division of H. K. Porter Co., Inc.), St. Charles.

**Clearfield.**—Leading producers of bituminous coal in Clearfield County in 1956 were: Robert Bailey, Benjamin Coal Co., Bradford Coal Co., Earl M. Brown Co., Cambria Clearfield Mining Co., Diamond T. Strip Mining Corp., The Morrisdale Coal Mining Co., Moshannon Smithing Coal Corp., Penbrook Contracting Co., and Shawville Coal Co. Bituminous coal was produced from underground, strip, and auger mines; the majority of the coal came from stripping.

Clearfield County was the leading clay-producing county in Pennsylvania in 1956, with 23 percent of the total value of clay output. Eighteen underground and open-pit clay mines were operated by 15 companies producing plastic and flint fire clay and miscellaneous clay. The clay was sold or used by the producers, mainly in manufacturing refractory firebrick and block and heavy clay products. Ten leading clay producers, in order of importance, were: Harbison-Walker Refractories Co., various mines in Clearfield County; General Refractories Co., Clearfield; Williamsgrove Clay Products Co., Inc., Bigler; North American Refractories Co., Curwensville; Hiram Swank's Sons, Inc., Boardman; W. K. Turner & Sons, Wallaceton; Blair Clay Products, Inc., Curwensville; Robinson Clay Products Co. of Pa., Clearfield; Falls Creek Refractories Co., Curwensville; and Laclede-Christy Co., Division of H. K. Porter Co., Inc., Henderson, Wallaceton, Clearfield, Osceola Mills, and Bigler.

Clearfield Limestone Corp. began a new sand and gravel operation near DuBois in February 1956. Quantities of paving gravel were recovered by this company, although adverse weather conditions affected installation of the plant and production of sand and gravel.

Exfoliated vermiculite was produced by Harbison-Walker Refractories Co. at one of its brick plants at Clearfield, utilizing the material for the manufacture of insulating firebrick.

**Clinton.**—Leading producers of bituminous coal in Clinton County in 1956 were: Joseph Antosh, Harry Batschelet Estate, Martin & Philip Barnyak, C. V. Fink & Son, R. C. Gillen, Parsons Bros., John E. Teeter, Thomson Coal Co., D. G. Wertz Coal Co., and Frank Winkelman. Bituminous coal was produced from underground, strip, and auger operations.

Lycoming Silica Sand Co. operated the Salona quarry and plant at Salona, producing crushed limestone usable as road material and railroad ballast.

North American Refractories Co. produced plastic fire clay from an underground mine near Lock Haven and flint fire clay from an open-pit mine near Renovo. All material was used for manufacturing refractory fire brick and block and a small quantity of mortar. Mill Hall Clay Products, Inc. (Castanea), produced miscellaneous clay from an open pit for use in making heavy clay products. Kelsey Mining Co. (Lock Haven) reported production of diaspore-type fire clay from an open pit, sold for manufacturing refractory high-alumina brick.

Digitized by Google

**Columbia.**—Output of anthracite in Columbia County was reported by operators of underground mines, strip pits, culm banks, and dredges. Ten of the leading producers were: Coates Coal Co., Hazlebrook Coal Co., L. & M. Coal Co., Miller Coal Co., Pine Ridge Mining Co., Raven Run Coal Co., Reading Anthracite Co., Sanchez Construction Co., Sullivan Trail Coal Co., and Susquehanna Collieries Division of The M. A. Hanna Co.

Bloomsburg Sand & Gravel Co. (Bloomsburg) recovered sand and gravel from a pit and processed the material at its local plant for use as building material.

Lloyd E. Eister produced miscellaneous clay from an open pit near Briar Creek for use in manufacturing heavy clay products.

**Crawford.**—W. L. Dunn (Cochranton) reported output of bank-run sand and gravel washed and screened at a local processing plant and marketed for use as paving material. Meadville Supply Co. produced washed building sand and gravel and a quantity of unwashed gravel for miscellaneous uses, from a bank and local plant at Saegertown. Conneaut Lake Sand & Gravel (formerly Sand & Gravel Supply) produced bank-run sand and gravel processed for use as building sand and gravel and paving sand and a quantity of unwashed gravel for building and paving material at Conneaut Lake. Fairfield Sand & Gravel Co. (Cochranton) produced sand for building and paving purposes, as well as molding sand.

**Cumberland.**—Locust Point Stone Quarries produced crushed limestone from a quarry and plant at Mechanicsburg, for use as road material and for agricultural purposes. Crushed limestone was recovered from quarries, for use as road material, by Valley Quarries Inc., Shippensburg; R. W. Smith & Son, Bowmansdale; and Hempt Bros., Camp Hill.

R. A. Bender & Son (Mount Holly Springs) and C. & L. Goodhart (Walnut Bottom) recovered sand from pits and processed the material for use as building sand at the local company plants. Hempt Bros. reported producing washed paving sand and gravel at its pit and plant at Camp Hill.

Kaolin, sold for use in making portland and other hydraulic cements, was recovered by Philadelphia Clay Co. from an open pit near Mount Holly Springs.

**Dauphin.**—Bethlehem Limestone Co. recovered limestone from a quarry at Steelton, crushing the stone at its local plant for use as blast-furnace flux, road material, railroad ballast, and stone sand and in refractories. Hoffman Bros. & Wilson, Inc., operated the Elder quarry at Harrisburg, producing limestone crushed for use as road material. Both companies sold crushed stone under contract to Government agencies. H. E. Millard Lime & Stone Co. produced limestone from its underground mine west of Palmyra in Dauphin County, crushed for use as blast-furnace flux, road material, railroad ballast, and agricultural purposes. Quantities of limestone were utilized at the company Swatara plant for manufacturing cement and quick and hydrated lime.

Seven companies produced anthracite in Dauphin County in 1956. Producers were: Dayton Breaker, Howard Koppenhaver, Reed & Weist, Rhoades Construction Co., Spring Glen Coal Co., Upper Dauphin Coal Co., and Wisconsino Washery, Inc. Underground

465877—58——63

Digitized by Google

mines, strip pits, culm banks, and dredges were operated by these producers.

Bethlehem Limestone Co. produced miscellaneous clay from an open pit near Steelton and sold the material for use in manufacturing refractories for foundries and steelworks, and covering for underground pipelines. Glen-Gery Shale Brick Corp. (Harrisburg and Middletown) produced miscellaneous clay and used it for manufacturing building brick.

F. H. Downey, Inc., operated a dredge on the Susquehanna River near Harrisburg and produced molding sand. Paving sand and gravel was recovered from a pit and fixed plant by Highspire Sand & Gravel Co., Ltd. (High Spire).

**Delaware.**—Two stone quarries and plants operated by The General Crushed Stone Co. (Glen Mills) and V. DiFrancesco & Sons (Llanerch) yielded crushed basalt for use as road material and railroad ballast. Both companies sold stone to adjacent Government agencies for various uses. Lima Building Stone Quarry, Inc. (Lima), quarried irregular-shaped dimension granite for use as construction material. Dimension sandstone for use as rough construction and rubble, was produced by Media Quarry Co. (Media).

Sinclair Refining Co. produced brimstone as a byproduct in the liquid purification of gas by the Claus-type process at its Marcus Hook Refinery (borough of Trainor).

Crude perlite from Western United States was purchased by Perlite Products Co., processed at its local expanding plant at Primos, and sold for use in plaster, concrete, refractories, and horticultural products.

**Elk.**—Bituminous coal produced in Elk County was mined from underground, strip, and auger operations. Leading producers of bituminous coal were: Betta & Meixel, Blue Valley Coal Co., Brandy Camp Coal Co., Hard Coal Co., W. C. Miller, New Shawmut Mining Co., Perry & Vonslander, P. & N. Coal Co., Inc., Walburn Coal Co., and Wabash Ridge Corp.

Saint Marys Sewer Pipe Co. (St. Marys) produced plastic-type fire clay from an open pit, utilized at the local plant for making heavy clay products. Wm. J. Meyer produced plastic-type fire clay from an open pit near St. Marys and sold it for use in manufacturing firebrick.

**Erie.**—Peerless Mineral Products Co. reported production of unwashed molding sand from a pit near Springfield. Wagner Concrete Building Products (Erie) produced a quantity of prepared gravel for miscellaneous uses and sold its operation to A. Duchini Co. in December 1956. Building sand and gravel was mined by North Girard Concrete Works (Lake City). Nickel Plate Sand & Gravel Co. (near Fairview) recovered washed sand and gravel for use as construction and paving material and unwashed bank gravel for miscellaneous uses.

Reed-sedge and humus peat was produced by Corry Bog, Inc., from a bog near Corry.

**Fayette.**—Bituminous coal was produced in Fayette County from underground, strip, and auger mines—the major portion from strip mines. Leading producers were: Bridgeview Coal Co., Davidson-Connellsville Coal & Coke Co., Eastern Gas & Fuel Associates, Coal

Digitized by Google

Division; Eberly Coal & Coke Co., Latrobe Construction Co., Marsolino Construction Co., Menallen Coke Co., National Mines Corp., Republic Steel Corp., and United States Steel Corp.

Robert N. Matthews (Uniontown) reported production of plastic and flint fire clay; Big Savage Refractories, Division of Mexico Refractories Co. (Ohiopyle), plastic fire clay; and Harbison-Walker Refractories Co. (Ohiopyle), flint fire clay. Material from these three companies was sold or used by the producers for the manufacture of firebrick and block. Layton Fire Clay Co. (Layton) produced miscellaneous clay from open-pit and underground mines and utilized its production in manufacturing heavy clay products.

Output of limestone from the Lake Lynn quarry by Vesco Corp. was crushed at a portable plant for use as road material and dust for coal mines and for agricultural purposes. Crushed sandstone usable for road material was produced from a quarry and crusher by Connellsville Bluestone Co. near Scottdale. Quantities of the material were sold to State and local Government agencies. General Refractories Co. produced ganister rock from the Childs quarry at Layton, moving it by tramway to a nearby plant for use in manufacturing silica brick.

Sand and gravel washed and screened for building and paving purposes was recovered by dredging at Point Marion by McClain Sand Co.

**Forest.**—Tionesta Sand & Gravel mined building sand and gravel, paving sand, and gravel for miscellaneous uses from a pit at Tionesta and washed and screened the material at a local plant.

**Franklin.**—Crushed limestone sold primarily for use as road material, and railroad ballast and for agricultural purposes was recovered by 6 operators of 7 quarries and crushing plants. Producers were: New Enterprise Lime & Stone Co., Inc., Dry Run; Fry Coal & Stone Co., Williamson and Zullinger; Pinola Lime Co., Shippensburg; Valley Quarries, Inc., Chambersburg; and Baer & Martin, Orrstown. Quantities of limestone were sold under contract to Government agencies for road material.

Mount Cydonia Sand Co., Inc., and Caledonia Sand Co. (both near Fayetteville) produced washed sand from pits and fixed plants for use as building material. E. L. Dayhoff & Sons recovered a quantity of paving sand.

Frank L. Heinbaugh operated the Blue Spring Lime plant at Mercersburg and produced quicklime for agricultural purposes.

**Fulton.**—Rockhill Coal Co., the only producer of bituminous coal in Fulton County, mined coal from a strip operation.

Limestone was produced by H. B. Mellott Estate, Inc., from the Charleton quarry (Warfordsburg) and the Morton quarry (Big Cove Tannery). The limestone was crushed and sold for road construction and agricultural purposes. Quantities of the road material were sold under contract to Government agencies.

Quicklime was produced and sold for agricultural purposes by John P. Martz & Son (Hustontown).

**Greene.**—Major production of bituminous coal in Greene County was mined from underground mines, with a small quantity from strip mines. Leading producers were: The Buckeye Coal Co., Crucible Steel Co. of America, Duquesne Light Co., Emerald Coal & Coke

Digitized by Google

Co., Jimmie's Coal Co., Jones & Laughlin Steel Corp., Mather Collieries, Rosedale Coal Co., Rosedale Mining Co., and United States Steel Corp.

Miscellaneous clay, recovered from an open pit near Waynesburg by Greene County Brick & Stone Co., was used for manufacturing heavy clay products.

**Huntingdon.**—Fire or furnace sand and a quantity of sand for miscellaneous uses was produced by Alexandria Fire Clay Co. from a pit and local plant at Alexandria. Pennsylvania Glass Sand Corp. operated a quarry and crusher at Mapleton Depot, recovering sand for use as glass sand, molding sand, grinding and polishing sand, and engine sand and for miscellaneous uses. In addition, ground sand was produced primarily for use in making enamel, foundry molds, glass, and pottery and as an abrasive in a filler.

Tyrone Lime & Stone Co. quarried limestone from the Stover quarry east of Tyrone in Huntingdon County and crushed it at a local plant for use as road material and for agricultural purposes. Limestone recovered from a quarry at Union Furnace by Warner Co., Bellefonte Division, was crushed at a local plant and marketed for use as riprap, road material, and railroad ballast. New Enterprise Stone & Lime Co., Inc. (McConnellstown), quarried and crushed limestone for road material and sold a quantity under contract to Pennsylvania Department of Highways. Output of ganister rock, crushed for use in manufacturing silica brick, was quarried by Harbison-Walker Refractories Co. (Mount Union) and North American Refractories Co. (Three Springs).

Leading producers of bituminous coal in Huntingdon County in 1956 were: Ace Coal Co., Allen Coal Co., Kenneth Crotsley, Adam J. Black, Helm Coal Co., L. M. Hutcheson, Ramper & Schank, Warren L. Reed, Rockhill Coal Co., and Wrays Hill Coal Co. The coal was mined from underground and stripping operations.

Alexandria Fire Clay Co. produced and sold plastic fire clay recovered from an open pit near Alexandria.

**Indiana.**—The major output of bituminous coal produced in 1956 in Indiana County was from underground mines, followed by strip and auger mines, in order of importance. Leading producers were: Arcadia Co., Inc., Clearfield Bituminous Coal Corp., Conemaugh Mining Co., Crichton Coal & Coke Co., H. & H. Coal Co., Imperial Coal Corp., Morrisdale Coal Mining Co., P. & N. Coal Co., Pine Township Coal Co., Joseph Ragalini, and Rochester & Pittsburgh Coal Co.

Hiram Swank's Sons, Inc., produced plastic fire clay from the Swank No. 6 underground mine near Clymer and utilized the clay for manufacturing pouring refractories such as sleeves, nozzles, stoppers, etc.

Smicksburg Lime (Smicksburg) mined a small quantity of crushed limestone from an underground mine for agricultural purposes.

**Jefferson.**—Leading bituminous-coal producers in Jefferson County were: Anita Coal Mining Co., Gregg & Riddle Coal Co., Knisley Coal Co., F. A. Lorenzo, Rudolph Lundblad, Northwestern Mining & Exchange Co., P. & N. Coal Co., St. Marys Sewer Pipe Co., Spencer & Marsh Coal Co., Inc., and Worthville Coal Co. The coal was mined from underground and stripping operations.

Digitized by Google

Hanley Co. produced plastic fire clay from an underground mine near Summerville, and The Brockway Clay Co. (Brockway) produced plastic fire clay and miscellaneous clay. The entire output of clays was used in manufacturing heavy clay products. Flint fire clay was recovered from an underground mine near Brookville by Henry O'Neill & Co. and marketed for use in the manufacture of refractory firebrick and block.

**Juniata.**—Limestone quarried and crushed principally for road construction was produced by W. N. Quigley (Mifflintown) and Juniata Limestone Co. (McAlisterville). National Refractories Division, Mexico Refractories Co. quarried ganister rock and utilized the crushed stone in manufacturing silica brick at its Van Dyke plant (Thompsontown).

Fulkroad Lime Quarry (near Mifflintown) produced a small quantity of quicklime for agricultural purposes.

**Lackawanna.**—Anthracite (the only mineral commodity produced in Lackawanna County in 1956) was mined from underground mines, strip pits, and culm banks. Leading producers were: Bellevue Coal Co., DeAngelis Coal Co., DeAngelis Supreme Anthracite Co., Gillen Coal Co., Hudson Coal Co., Moffat Coal Co., Northwest Coal Co., Perry Construction Co., Turnpike Coal Co., and Village Slope Coal Co.

**Lancaster.**—Limestone was recovered from 15 quarries operated by 13 companies in Lancaster County in 1956. Two of the companies—J. C. Showalter (Blue Ball) and L. F. Zook & Sons (Bareville)—produced dimension limestone as rough construction stone and crushed limestone as road material. Crushed limestone, principally for use as road material and stone sand, for agricultural purposes, and for manufacturing lime was produced by The J. E. Baker Co., Bainbridge; Binkley & Ober, Inc., East Petersburg; David M. Burkholder, Martindale; Erbs Limestone Quarry, Lititz; J. Miller Eshleman, Landisville; A. G. Kurtz & Sons, Inc., Denver; Landis Stone Meal Co. and Heisey Bros., both at Rheems; Ivan M. Martin, Inc., Blue Ball; D. M. Stoltzfus & Son, Inc., Quarryville and Talmage; and Bradford Hills Quarry, Inc., Lititz, and west of Morgantown in Lancaster County.

The J. E. Baker Co. manufactured dead-burned dolomite at its Billmyer plant near Bainbridge and marketed it as refractory material. Amos K. Stoltzfus produced quicklime for agricultural purposes at the Maxwell Hill plant 2 miles west of Morgantown.

Anthracite was recovered in Lancaster County by dredging operations.

Milton Grove Sand, Inc. (Milton Grove), and Hempt Bros. (Elizabethtown) recovered sand from pits and processed it for use as paving material.

Miscellaneous clay, utilized entirely for the manufacture of heavy clay products, was recovered from open pits by Glen-Gery Shale Brick Corp., Ephrata, and Lancaster Brick Co., Lancaster. Plastic fire clay was recovered from an open pit near Narvon by Whitaker Clay Co. and marketed for use in the manufacture of high-alumina refractories.

**Lawrence.**—The Bessemer Limestone & Cement Co. cement plant at Bessemer produced air-entrained Types I–II, non-air-entrained Types I–II, Type III, portland-pozzolan, and waterproof-portland cement. Mortar cement also was produced and marketed under the

Digitized by Google

trade name "Bessemer Mortar." Medusa Portland Cement Co. produced cement from its plant at Wampum. Production consisted of Types I–II, and Type III, waterproof-portland cement, and "Brikset" mortar cement.

A quarry and crusher operated by Michigan Limestone Division, United States Steel Corp., at Hillsville produced crushed limestone for use as blast-furnace and open-hearth flux and road material and for manufacturing cement. Crushed limestone for use as road material and in manufacturing cement was produced by The Bessemer Limestone & Cement Co. from a quarry and crusher at Bessemer. New Castle Lime & Stone Co. worked its quarry and crusher at Mahoning Township, producing crushed limestone usable for road construction, agricultural purposes, and dusting for coal mines. Medusa Portland Cement Co. recovered limestone from its quarry and crushed the stone at its plant at Wampum, for manufacturing cement.

Bituminous coal produced in Lawrence County was obtained from underground and strip mines. Leading producers were: Ambrosia Coal & Construction Co., Bessemer Limestone & Cement Co., Clark & Kechmar Coal Co., Corry Excavating & Mining Co., Dodds Coal Co., J. H. Filby Coal Co., Ivywood Coal Co., Keystone Valley Coal Co., Lake Erie Mining Enterprises, Inc., and West Freedom Mining Co.

Keystone Sand & Gravel Co. (New Castle) operated an open-pit mine producing miscellaneous clay and marketed it for use in manufacturing refractories. Plastic fire clay and miscellaneous clay were recovered from open pits by Metropolitan Brick, Inc. (near Bessemer), and Fenati Brick Co., Inc. (New Castle), for use in manufacturing heavy clay products.

Sand and gravel recovered from a pit at West Pittsburgh by Mahoning Valley Sand Co. was processed at the local plant for use as construction and paving material, and a quantity of gravel for fill. Superior Sand & Supply Co. reported output of paving sand and gravel from a pit and plant near Eastbrook. United States Army Corps of Engineers (Philadelphia), purchased a quantity of sand and gravel from commercial producers for use in concrete construction.

Zonolite Co. produced crude vermiculite from mines in Western United States and imported a quantity from South Africa, producing exfoliated vermiculite at its plant at Ellwood City.

**Lebanon.**—Lebanon was the only county in the State in 1956 in which metallic ores were produced. The Cornwall mine and Lebanon concentrator plant operated by Bethlehem Cornwall Corp., a subsidiary of Bethlehem Steel Co., yielded magnetite iron ore from which gold, silver, copper, cobalt, and pyrite were recovered as byproducts.

Of the 6 companies producing crushed limestone in Lebanon County, 3 reported output for road material only—Fiala Crushed Stone Corp. and Becker Bros. (both of Annville) and Pennsylvania Aggregates, Inc. (Cornwall). Calcite Quarry Corp. produced crushed limestone usable as flux, and road material from a quarry and crusher near Lebanon. H. E. Millard Lime & Stone Co. produced (from its quarry and crusher at Annville), crushed limestone sold for use as blast-furnace flux, road material, and soil conditioner and for manufacturing cement. This company also sold a quantity of limestone

Digitized by Google

to Government agencies for road construction. Crushed limestone was recovered by Fiala Crushed Stone Corp. from the White Hall quarry at Annville for use in open-hearth plants and in manufacturing cement. North American Refractories Co. operated the Womelsdorf quarry and plant, producing crushed ganister rock for manufacturing silica brick.

The only producer of lime in Lebanon County was H. E. Millard Lime & Stone Co. Quick and hydrated lime was manufactured at the Annville plant and marketed primarily as mason lime and agricultural lime, for use in open-hearth and electric furnace linings and for water purification.

Dredging operations were the only source from which anthracite was recovered in Lebanon County.

**Lehigh.**—Four companies reported manufacturing cement in Lehigh County from cement rock and limestone produced from company-owned quarries or purchased from other stone producers. Cement manufacturers were: The Whitehall Cement Manufacturing Co., Cementon; Coplay Cement Manufacturing Co., Coplay; Giant Portland Cement Co., Egypt; and Lehigh Portland Cement Co., Ormrod and Fogelsville. The major portion of the cement produced was air-entrained and non-air-entrained Types I–II and Type III portland cements and mortar cement, all by the dry process.

Production of crushed limestone from a quarry and crusher at Ormrod, for use in road construction, was reported by Lehigh Stone Co. Quantities of the material were sold to local Government agencies.

Slate quarried in Lehigh County in 1956 was sold for a variety of uses, primarily for roofing, structural, and sanitary products, blackboards, and flagging stone. The only producer of slate was Penn Big Bed Slate Co., Inc., near Slatington.

Robert A. Reichard, Inc. (Allentown), crushed oystershell for use as poultry grit.

Pennsylvania Perlite Corp., at its expanding plant near Allentown, produced expanded perlite for use in the manufacture of plaster aggregate, concrete aggregate, and industrial aggregates.

**Luzerne.**—Luzerne County in 1956 was by far the largest anthracite-producing county in the State. Ten of the larger producers were: John G. Connell, Glen Alden Corp., Hudson Coal Co., Jeddo-Highland Coal Co., Kehoe-Berge Coal Co., Knox Coal Co., Lehigh Valley Coal Co., Number Fourteen Coal Co., Payne Coal Co., and Susquehanna Collieries Division of The M. A. Hanna Co. The coal was produced at underground mines, strip pits, culm banks, and dredges.

Dimension sandstone, recovered from a quarry at White Haven by Hayes Bros. Stone Co., was sold or used as rubble, dressed architectural stone, and flagging stone. The General Crushed Stone Co. (White Haven) quarried and crushed sandstone for use as road material and railroad ballast. A small quantity of dimension sandstone for use as rubble and of crushed sandstone for use as riprap and road material was recovered from the North Mountain quarry in Sweet Valley by Coon Certified Concrete. The General Crushed Stone Co. and Coon Certified Concrete marketed sandstone to various Government agencies.

Digitized by Google

Seven companies were active in Luzerne County in 1956, producing sand and gravel for use as paving and building material, as engine sand, and as sand for miscellaneous uses. Producers were: Airport Sand & Gravel, Wyoming; American Asphalt Paving Co., Chase (Jackson Township); Glendale Sand & Stone Co., Avoca; Frank B. Sgarlat Estate, Kingston; Honey Hole Sand & Stone Co. and Herman Cunfer, both of Hazleton; and White Haven Lumber Co., White Haven. A large tonnage of sand and gravel was sold to local Government agencies for use in highway construction.

Blue Ridge Soil Pep Co., Inc., recovered humus peat and Pennsylvania Peat Moss, Inc., recovered moss and humus peat, both from bogs near White Haven.

Miscellaneous clay, recovered from an open pit near Hazleton by Hazleton Brick Co., was utilized in manufacturing building brick.

**Lycoming.**—J. A. Eck & Sons, Inc., and Lycoming Silica Sand Co. recovered sand and gravel from pits in Montoursville and processed the material at local plants for construction and paving purposes. Lycoming Silica Sand Co. also produced molding sand, sand for use in anthracite preparation, and paving sand.

Muncy Lime Products produced a quantity of crushed limestone from its Chippewa quarry and plant at Muncy for manufacturing agricultural lime. Lycoming Silica Sand Co. produced limestone, crushed for use as road material and agricultural purposes, from the Lime Bluff quarry and plant near Muncy and the Pine Creek quarry and plant near Jersey Shore (purchased from Pine Creek Lime & Stone Co. in February 1956). Callahan & Haines Stone Co. produced miscellaneous dimension stone as flagging stone from a quarry and plant at Slate Run. John T. Morgan (also of Slate Run) reported a small quantity of dimension sandstone for flagging stone.

Small quantities of bituminous coal were produced from 4 underground mines and 1 strip pit by O. R. Corson, J. F. Emig, Fisher & Smith Coal Corp., Kaznowski & Kaznowski, and Thomas Bros.

Keystone Filler & Manufacturing Co. (Muncy) and Penn Paint & Filler Co. (Antes Fort) produced and prepared rottenstone by crushing, drying, and pulverizing. Both companies sold the material for use as abrasive and filler.

Keystone Filler & Manufacturing Co. (Muncy) marketed its production of miscellaneous clay as a paint filler.

**McKean.**—Kaul Clay Products Co. produced plastic fire clay from its pit at Clermont for use in manufacturing hot-tops for steel mills and heavy clay products. Plastic and burley-type fire clays produced by Kness Bros. (Mount Jewett) were marketed for use in manufacturing refractories. Miscellaneous clay produced by Hanley Co. (Lewis Run) was utilized by the company for use in manufacturing heavy clay products.

Three operators of strip mines in McKean County produced bituminous coal. Producers were: Bowland Contractors, Kaul Clay Products Co., and P. & K., Inc.

Sand (mined by C. L. McGavern, Jr., from a pit and plant at Eldred) was processed and sold as molding sand.

**Mercer.**—Underground and strip mines were operated in Mercer County as sources of bituminous coal. Producers were: Coyer Coal Mines, Estate of Geo. Bobo, Bowie Coal Co., The Buckeye Coal Co.,

Digitized by Google

Center Coal Co., C. A. Fisher Mining Co., Thomas B. Mathieson, Mercer Coal Producing Co., Earl M. Reed Coal Co., and Turner Bros. Construction Co.

Sand and gravel was recovered from pits by four producers and processed for various uses, principally as paving and building material and sand for fill. Producers were: Robert L. Seger, West Middlesex; Seidle Sand & Gravel Co., Mercer; Transfer Sand & Gravel, Transfer; and Sharon Builders Supply Co., Mercer County. White Rock Silica Sand Co. operated the Whiterock quarry and preparation plant at Greenville, producing ground sand principally as filler sand, foundry sand, and beach sand and for use on golf courses.

D. M. Boyd and Moore's Peat Humus Co. (both near Leesburg) and Arthur Minshull (Jackson Center) all recovered humus-type peat from bogs.

Welty M. Smeltzer recovered dimension sandstone from the Rock Kastle quarry north of Volant in Mercer County. The stone was used for interior and exterior decorating; some of the stone is found with flower patterns and in multicolored stone in red, soft pink, yellow, brown or chocolate and some in mottled beige with dark stripes.

**Mifflin.**—Miller Silica Sand Co. operated a pit and fixed plant near Burnham, producing sand for molding and building material and engine sand and for miscellaneous uses. Pennsylvania Glass Sand Corp. produced sand from an open pit and processed it at a local plant at McVeytown for use as glass sand, molding sand, grinding and polishing sand, and engine sand and for miscellaneous uses. James R. Kline's Sons recovered sand by dredging along the Juniata River near Lewistown for building and paving material.

Bethlehem Limestone Co. reported output of crushed limestone from its quarry and crusher at Naginey, marketed principally for use as blast-furnace flux, roadstone, and stone sand. A portion of the material was sold under contract to Government agencies for road construction. Output of quartzite from a quarry at Hawstone was utilized by Haws Refractories Co. for producing silica brick at the company plant.

Quicklime (manufactured and sold as agricultural lime) and hydrated lime for use in making silica brick were reported by Lewistown Lime Co. from its plant near Reedsville. Harry T. Ehrenzeller (McVeytown) produced quicklime for agricultural uses.

**Monroe.**—Coolbaugh Sand & Stone, Inc. (Tobyhanna), operated a pit and plant, producing sand and gravel for building and paving purposes. Sheesley Minerals, Inc., recovered sand from a pit and prepared it at its Kunkletown plant for use as paving and road sand. Both companies sold the entire output, the major portion to the Pennsylvania Department of Highways for road construction. Steward White and Clyde White (Stroudsburg) produced a quantity of building sand. United States Army Corps of Engineers (Philadelphia), purchased a quantity of sand and gravel as concrete aggregate from commercial producers.

Crushed limestone marketed entirely for road construction, was produced from a quarry and crusher by T. P. Rogers Stone Co. (Stroudsburg). This quarry and plant was sold to Hamilton Stone Co. in July 1956. Hamilton Stone Co. also operated a quarry and

Digitized by Google

plant at Bossardsville, producing crushed limestone for use as road material and in cement manufacture.

**Montgomery.**—Montgomery County continued in 1956 to rank first in stone output, although production and value decreased compared with 1955. Crushed limestone was produced by Stowe Trap Rock Co. (Oreland) for use as riprap, road material, and railroad ballast. Glasgow, Inc. (Conshohocken) and Bradford Hills Quarry, Inc. (Norristown), produced crushed limestone for road construction. G. & W. H. Corson, Inc., and Bethlehem Limestone Co. operated a quarry and crusher at Plymouth Meeting and Bridgeport, respectively, producing and marketing crushed limestone for blast-furnace and open-hearth flux, road material, and stone sand and in manufacturing lime. R. K. Kibblehouse produced basalt from a quarry and crusher at Perkiomenville for use as road material and marketed quantities to State and local Government agencies.

Rough and dressed dimension basalt for use as building material and crushed and broken basalt for railroad ballast were recovered at Montgomeryville by Montgomery Stone Co., Inc. Marcolina Bros., Inc., operated the Hillcrest quarry (Cheltenham Township), utilizing its production of irregular dimension granite for construction work. M & M Stone Co. quarried argillite-type miscellaneous stone for use as road material from a quarry at Harleysville. A. Manero & Sons (Glenside) produced silica rock from the Cove Hill quarry, as rough and dressed building stone. Fire Stone Products Co., Inc. (Glenside), quarried dimension quartzite for rough architectural blocks and crushed stone for furnace or converter lining. William Bambi & Sons (Norristown) produced dimension sandstone sold for use in rough construction work. Crushed sandstone usable for road material was produced and sold by Irvin B. Gill (Collegeville).

Allentown Portland Cement Co. produced cement rock and limestone at its quarry at West Conshohocken for use in manufacturing cement at the No. 2 plant. Production consisted of Types I–II, air-entrained, and non-air-entrained portland cements and some mortar cement.

Corsons Lime plant (Plymouth Meeting) was operated by G. W. H. Corson, Inc., for manufacturing lime. Quicklime and hydrated lime were produced and marketed for use as building lime, refractory material, and various chemical and other industrial limes.

Both miscellaneous and fire clays were produced from five open-pit mines; miscellaneous clay was the more important commodity. Robinson Clay Product Co. (near Pottstown) produced both plastic fire clay and miscellaneous clay for use in manufacturing heavy clay products. Other producers included The Keller-Whilldin Pottery Co., North Wales; Norristown Brick Co., and Harry R. Shaffer, both at Norristown; and Lansdale Brick Products Co., Lansdale. The output of these four companies was utilized for manufacturing art pottery, flowerpots, glaze slips, and heavy clay products.

Wm. Bambi & Sons, Inc., produced washed sand for use as building material from a pit and local plant at Norristown.

Refractory & Insulation Corp. produced expanded perlite at its expanding plant at Port Kennedy and utilized the perlite for manufacturing industrial insulation material.

Digitized by Google

Keasbey & Mattison Co. (Ambler) and Philip Carey Manufacturing Co. (Plymouth Meeting) processed raw dolomite, producing magnesium carbonate, magnesium oxide, and magnesia insulation.

**Montour.**—Limestone was recovered fom the Grovania quarry and crushed at the local plant by Mausdale Quarry Co. (Danville) and Lycoming Silica Sand Co. (from the Milton quarry and plant east of Milton, in Montour County), primarily for road construction. The Milton quarry was purchased from Narehood Bros., Inc., in May 1956. Both producers sold some of the material to Government agencies for road construction.

A small quantity of burned lime for agricultural uses was produced and sold by Glen H. Follmer near Washingtonville.

**Northampton.**—Northampton remained the leading cement-producing county in Pennsylvania in 1956 and showed a large increase in tonnage and value compared with 1955. Ten companies reported manufacturing cement from cement rock and limestone, either purchased or quarried at local company quarries. Producers were: Alpha Portland Cement Co., Martins Creek; Dragon Cement Co. and Universal Atlas Cement Co., both of Northampton; Hercules Cement Corp., Stockertown; Keystone Portland Cement Co., Bath; Lehigh Portland Cement Co., Sandts Eddy; Lone State Cement Corp. and Nazareth Cement Co., both of Nazareth; National Portland Cement Co., Bethlehem; and Penn-Dixie Cement Corp. plant No. 4 at Nazareth, plant No. 5 at Bath, and plant No. 6 at Penn Allen. The major output from these companies was comprised of Types I–II, Type III, both air-entrained and non-air-entrained portland cements and smaller quantities of masonry cements.

Production of slate in Northampton County in 1956 contributed a major portion of Pennsylvania's output and of Northeastern States production. Leading producers of slate were: Diamond Slate Co., Inc., Stephens-Jackson Co., Doney Slate Co., and Anthony Dally & Sons, Inc., all of Pen Argyl; D. Stoddard & Sons, Inc., and Albion Vein Slate Co., both of Plainfield Township; Parsons Bros. Slate Co., and General Slate Co., both of Windgap; North Bangor Slate Co., Bangor; and Capitol Slate Co., Inc., East Bangor. The processed slate was marketed for a variety of uses, primarily for roofing, blackboards and bulletin boards, structural and sanitary products, and billiard-table tops.

Crushed limestone for use as road material, railroad ballast, and stone sand was recovered from a quarry at Bethlehem by Bethlehem Steel Co. The Trumbower Co., Inc., produced limestone from a quarry and crushed the stone at Nazareth for road construction.

Sand and gravel was produced by open-pit methods by W. J. Lowe & Sons (Martins Creek) for use as concrete aggregate and by Portland Sand & Gravel Co. (Portland) for use as building and paving material. Portland Sand & Gravel Co. also produced gravel for railroad ballast, and a portion of its production was produced under contract to local Government agencies for use in road construction.

Anthracite in Northampton County was recovered by dredges.

**Northumberland.**—Ten leading anthracite-producing companies in Northumberland County were: Boslego Coal Co., C. & F. Trucking & Loading Contractors, C. & J. Coal Co., M. & B. Coal Co., Raven Run

Digitized by Google

Coal Co., Reading Anthracite Co., Sayre Contracting Co., Stevens Coal Co., Susquehanna Collieries Division of The M. A. Hanna Co., and West Cameron Coal Co., Inc. Coal was produced from underground mines, strip pits, culm banks, and dredges.

Three producers of clays operated open pits in Northumberland County, producing miscellaneous clay, used in manufacturing heavy clay products and as a filler in making linoleum, oilcloth, and phonograph records. Companies active during the year were Watsontown Brick Co., Watsontown Mineral Products Co., and Glen-Gery Shale Brick Corp. (all at Watsontown).

Limestone, recovered from a quarry at Herndon by Eugene Meckley, was crushed at a local plant and sold for road construction and agricultural purposes. Susquehanna Quarry Co. (Dalmatia) produced crushed traprock sold as riprap, concrete aggregate, roadstone, and railroad ballast. Quantities of road material were sold to local Government agencies.

M. E. Wallace Co. (Sunbury) produced molding sand from a pit and local plant. Wilsons Sand Plant (Milton) produced washed sand for building and miscellaneous uses.

Burned lime produced by Clyde Starook near Sunbury was sold for use as agricultural lime and marketed within a 50-mile radius.

**Perry.**—Bradford Hills Quarry, Inc. (Newport), reported output of crushed limestone from a quarry and crusher for use as road material. A quantity was sold to local Government agencies for road construction.

**Philadelphia.**—The Liberty Corp. operated a dredge on the Delaware River near Philadelphia and sold the washed and screened sand and gravel for use as building material. A quantity of the gravel also was sold to local Government agencies. United States Army Corps of Engineers (Philadelphia) purchased a quantity of sand and gravel from commercial producers for use in concrete construction.

Atlantic Refining Co. recovered hydrogen sulfide as a byproduct in the liquid purification of gas at its plant in Philadelphia.

**Potter.**—Oswayo Flag Stone Co. (Oswayo) reported a quantity of miscellaneous dimension stone recovered from its quarry, and sold for use as flagging stone. Dimension sandstone for use in rough construction and as architectural and flagging stone was quarried by Penn Kress Flagstone Co., Inc., Austin.

**Schuylkill.**—Anthracite in Schuylkill County was mined from underground, strip-pit, culm-bank and dredge operations. Leading producers were: Capparell Stripping & Construction Co., Carbonizing Coal Co., Coaldale Mining Co., Inc., Gilberton Coal Co., Locust Creek Co., Inc., Mammoth Coal Co., Reading Anthracite Co., Saint Clair Coal Co., Stevens Coal Co., and Tunnel Ridge Coal Co.

Refractory Sand Co., Inc. (near Andreas), mined and processed sand usable for paving, fire, or furnace sand and for miscellaneous uses.

Huss Contracting Co. took over operation of the Andreas Quarry Co. quarry at Andreas in April 1956, producing crushed limestone for use as road material. Crushed quartzite for manufacturing silica brick was mined by Harbison-Walker Refractories Co. from a quarry at Andreas.

Auburn Brick Co. produced miscellaneous clay from an open pit at Auburn and utilized it for manufacturing heavy clay products.

Digitized by Google

Coaldale Mining Co. operated underground and open-pit mines at Coaldale, producing miscellaneous clay marketed for use in manufacturing lightweight aggregate.

**Snyder.**—Miscellaneous clay produced by Glen-Gery Shale Brick Corp. (Beavertown) and Paxton Brick Co. (Middleburg) was utilized by the companies in manufacturing heavy clay products.

John C. Stahl acquired ownership during 1956 of a quarry and crusher at Middleburg, formerly operated by National Limestone Quarry; production consisted of crushed limestone for use as road material and agricultural purposes. Limestone recovered from a quarry by Carton Comfort (Mount Pleasant Mills) was crushed and marketed for use in the manufacture of lime.

A small quantity of "burned" lime for agricultural purposes was produced and sold by Carton Comfort at Freeburg.

A small quantity of anthracite produced from dredging operations was reported in Snyder County.

**Somerset.**—Bituminous coal was mined in Somerset County by underground and stripping methods. Leading producers were: Bird Coal Co., Costantino Coal Co., Cambria Fuel Co., Croner, Inc., Loyal Hanna Coal & Coke Co., Ponfeigh Smokeless Coal Co., Pine Hill Smokeless Coal Co., The Berwind-White Coal Co., Reitz Coal Co., and the Saxman Coal & Coke Co.

Fire clay used in manufacturing refractories and heavy clay products was recovered from underground and open-pit mines by W. S. Compton Brick Co., Inc., Salisbury; Otto Brick & Tile Works, Springs; Hiram Swank's Sons, Inc. (Swank Mines Nos. 15 and 23), Holsopple; and General Refractories Co. Neilan Engineers (Shanksville) produced flint fire clay from an open pit and sold the clay for manufacturing refractories.

Somerset Limestone Co., Inc., produced crushed limestone obtained from the Bakersville quarry at Somerset for road construction. Keystone Lime Co. produced limestone from an underground mine and quarry at Springs for agricultural purposes and as an asphalt filler. Friedens Block Co. (Somerset) quarried a small quantity of sandstone crushed for miscellaneous uses; this company sold its operation to Union Mining Co. in August 1956.

Sand only was produced in Somerset County by Boswell Sand Co. (near Jenners, Boswell Borough), for paving use, and by Union Mining Co. (Somerset) for building material and fire or furnace sand. Friedens Block Co. (Somerset) and Robert D. Shaulis (Boswell) also produced small quantities of building sand.

**Sullivan.**—Bliss Coal Co.—the only mineral-producing company in the county—reported a quantity of anthracite from a stripping operation.

**Susquehanna.**—Edwin J. Evans (Lenox Township) and H. V. Hartley (Lenoxville) quarried dimension sandstone for use as rubble and flagging stone. Keelor Supply Co. (Royal) produced crushed sandstone for road material and sold a quantity to local Government agencies. Three companies quarried dimension sandstone (bluestone) for use as flagging stone: Gordon E. Jackson, New Milford; Wade H. Swingle, Jr., Harford; and Lee A. Wilbur Flagstone Co., Kingsley. J. G. Robinson purchased sandstone from various stone producers in Susquehanna County and processed it at the Fort

Digitized by Google

Washington (Montgomery County) plant. The prepared stone was sold for flagging.

**Tioga.**—Bituminous coal (the only mineral commodity produced in Tioga County in 1956) was mined from underground and strip mines. Leading producers were: Fall Brook Coal Mining Co., Guy Coal Co., E. M. Hart & Son, Walter Hunter, Jones & Brague, Martin & Lawson, Stempeck Coal Co., Sterling Coal Co., and Joseph & James Williams.

**Union.**—Production of crushed limestone was reported by Faylor Lime & Stone Co. from a quarry and crusher at Winfield and marketed for use as road material and agricultural purposes and by John L. Iddings (Mifflinburg) for road construction. Both producers sold a portion of the road material to Government agencies.

**Venango.**—Leading producers of bituminous coal in Venango County in 1956 were: Bowie Coal Co., Boyles Coal & Supply Co., W. G. Brown Coal Co., C. & M. Contracting Co., Penn Grove Coal Co., Persch Bros. Coal Co., Earl M. Reid Coal Co., Glenn Surrena, Tasa Coal Co., and A. P. Weaver & Sons. The coal was produced at underground and strip mines.

Sand production was reported by Industrial Silica Corp. (Utica); it was prepared at a local plant for use as molding sand. Oil City Sand & Gravel Co. (Oil City) recovered building and paving sand and gravel by dredging and sold a quantity of it to the Pennsylvania Department of Highways for road construction. Rybak Kraft, Inc. (Cooperstown), produced washed and screened sand for use in manufacturing concrete blocks and sold a quantity of unscreened paving gravel to a local Government agency. This company only operated 6 months during the year owing to the cold weather.

**Warren.**—Building and paving sand and gravel were recovered from an open pit and processed at a local plant by General Concrete Products near Warren. Walter Schatzle (Warren) produced a quantity of building sand and gravel and gravel for use as a rough filler.

**Washington.**—Washington County was the leading bituminous coal-producing area in the State in 1956. The major portion of the coal recovered was from underground mines, followed by strip and auger mines. Leading producers were: Bethlehem Steel Co., C. & J. Coal Co., Harmon Creek Coal Corp., Jones & Laughlin Steel Corp., Mathies Coal Co., National Steel Corp., Ontario Mining Co., Pittsburgh Coal Co., Republic Steel Corp., and United States Steel Corp.

Miscellaneous clay for use in manufacturing heavy clay products was mined from open pits by Monongahela Clay Products Co., Monongahela; and Westmoreland Clay Products Co. and Donley Brick Co., both near Washington.

**Wayne.**—Wayne Concrete & Sand Works produced crushed sandstone for use as road material from a quarry and plant at Lake Ariel.

A pit near Lake Ariel, operated by Wayne Concrete & Sand Works, yielded sand and gravel prepared at the local plant for use as building and paving material. A quantity of sand for bridge construction was sold to Pennsylvania Department of Highways.

**Westmoreland.**—Ten leading producers of bituminous coal in Westmoreland County were: Allegheny Pittsburgh Coal Co., Bowman Coal Co., Delmont Fuel Co., Eagle Coal Co., Jamison Coal & Coke Co., Marco Coal Co., Pine Run Co., Stewart Coal & Coke Co.,

Digitized by Google

Westmoreland Coal Co., and Wyatt-Seanor Coal Co. The major production of the bituminous coal came from underground mines followed by strip and auger mines.

Lynn Quarry (Rostraver Township) yielded miscellaneous dimension stone sold as flagging stone. Dimension sandstone, sold for rubble, was recovered from quarries by Ray Branthoover and J. C. Beaumont, both north of Belle Vernon in Westmoreland County. Eidemiller Enterprises, Inc. (Greensburg), produced crushed sandstone from blue rock, and Latrobe Construction Co. produced crushed sandstone from the Barbara quarry at Latrobe; both sold the stone for road material.

Westmoreland Clay Products Co. produced miscellaneous clay for use in manufacturing heavy clay products from its open pit near Youngwood. Regional Refractories, Inc., operated its open pit near Youngwood, producing plastic fire clay for use in manufacturing refractory firebrick and block.

**Wyoming.**—Two commercial producers of sand and gravel—East Falls Sand & Gravel (near Tunkhannock) and Wyoming Sand & Stone Co. (Falls) operated pits and preparation plants, washing and screening the material for building and paving uses. Wyoming Sand & Stone Co. also prepared engine sand. Both companies sold quantities of sand and gravel to Pennsylvania Department of Highways and local Government agencies for road construction.

J. G. Robinson purchased sandstone from various stone producers in Wyoming County and processed the stone at the Fort Washington (Montgomery County) plant. The prepared stone was sold as flagging stone.

**York.**—Medusa Portland Cement Co. reported output of cement manufactured at its York plant. Portland cement Types I–II, Type III, waterproof-white, and gray and quantities of masonry cement were marketed under the trade names of "Brikset" and "Stoneset."

Nine stone producers were active in York County in 1956, reporting output of crushed limestone sold or used primarily as road material and riprap, for agricultural purposes, and in manufacturing glass, lime, and cement. Producers were: The J. E. Baker Co., Botts; National Gypsum Co., Standard Concrete Products Co., Medusa Portland Cement Co., White Pigment Corp., York Stone & Supply Co., and Eli Z. Zinn, Inc., all of York; Thomasville Stone & Lime Co. and Lincoln Stone, Inc., both of Thomasville.

The York plant of National Gypsum Co. was active during the year, producing both quicklime and hydrated lime, manufactured for a variety of uses, including agricultural lime, insecticides, disinfectants, paper, sewage treatment, and water purification. The J. E. Baker Co. produced dead-burned dolomite at its York plant near Botts for use as refractory material.

The Funkhouser Co. (Delta) was the only slate producer in York County in 1956. The slate was crushed and ground at its local mill and sold as granules and flour.

Production of miscellaneous clay from open-pit mines was utilized by Glen-Gery Shale Brick Corp. for manufacturing heavy clay products at its York Colonial Division plant and Spring Garden Division plant (both near York).

Digitized by Google

Sand and gravel for use as paving material was recovered from a pit near York Haven by Pennsylvania Supply Co. Neuman Sand & Supply Co. produced sand from a pit and preparation plant at York, principally as building sand, with smaller quantities as molding and fire or furance sand.

General Mining Associates operated an open-pit mine and plant near Glenville, producing and grinding mica, which was utilized in making paints, rubber (mold lubricants), and welding rods.

Digitized by Google

# The Mineral Industry of the Commonwealth of Puerto Rico, the Panama Canal Zone, and the Virgin Islands

The Puerto Rico portion of this chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Mineralogy and Geology Section, Commonwealth of Puerto Rico.

By W. G. Diamond [1] and Mort D. Turner [2]

A RECORD high in value of mineral production was established in Puerto Rico in 1956 for the second consecutive year with $16.4 million. This exceeds by $1.5 million the previous mark set in 1955.

The first concession to drill for oil in Puerto Rico was granted in 1956. The Economic Development Administration of Puerto Rico made geological and geophysical studies which indicated that there may be oil in the southern part of the island. Although no petroleum or natural gas was produced in Puerto Rico, 2 refineries were operating in 1956—the Commonwealth Oil Refining Co. 23,520-barrel-per-day plant at Ponce and the Caribbean Refining Co. 13,500-barrel-per-day

**TABLE 1.—Mineral production in possessions of the United States, 1955–56, by individual minerals [1]**

| Possession and mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Canal Zone: | | | | |
| Sand and gravel | 35,910 | $47,229 | 40,095 | $48,673 |
| Stone (crushed) [3] | 169,485 | 239,280 | 177,250 | 229,750 |
| Total Canal Zone | | 287,000 | | 278,000 |
| Puerto Rico: | | | | |
| Cement—376-pound barrels | 4,116,739 | 12,506,784 | 4,254,701 | 14,064,982 |
| Clays | 136,563 | 121,753 | 142,666 | 129,166 |
| Lime | 10,392 | 254,121 | (3) | (3) |
| Salt (common) | 10,496 | 112,399 | 9,936 | 101,243 |
| Sand and gravel | 433,017 | 678,761 | 183,046 | 191,485 |
| Stone | 1,783,910 | 2,515,760 | 2,076,453 | 2,555,585 |
| Value of items that cannot be disclosed: | | | | |
| Certain nonmetals | | | | 194,941 |
| Total Puerto Rico [4] | | 14,917,000 | | 16,395,000 |
| Virgin Islands: Basalt | 875 | 4,900 | 11,591 | 31,983 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Includes basalt.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] The total has been adjusted to eliminate duplication in value of clays and stone.

[1] Commodity-industry economist, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] Chief geologist, Mineralogy and Geology Section, Economic Development Administration, Commonwealth of Puerto Rico.



Digitized by Google

plant at San Juan; both processed Latin-American crude. Commonwealth Oil Refining Co. announced an expansion program to increase its daily crude topping capacity to 55,000 barrels by late 1957.[3]

The investigation of nickel-cobalt-bearing laterite deposits was conducted by the Federal Bureau of Mines in cooperation with the Commonwealth of Puerto Rico. The project included mapping, systematic drilling by power auger, sampling of hole sections, and chemical and mineralogical analysis of the samples. No metals were mined in Puerto Rico in 1956.

**TABLE 2.—Average unit value of mineral commodities in the Canal Zone, Puerto Rico, and the Virgin Islands, 1952–56** [1]

| Area and commodity | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Canal Zone: | | | | | |
| Basalt, crushed and broken, short ton | $1.77 | $1.85 | $1.31 | $2.02 | $1.84 |
| Sand and gravel, do | .94 | 1.11 | | 1.32 | 1.21 |
| Stone, miscellaneous, crushed, do | | | | 1.10 | 1.00 |
| Puerto Rico: | | | | | |
| Cement, 376-pound barrel | 2.63 | 2.56 | 2.62 | 3.04 | 3.31 |
| Iron ore, long ton | 5.75 | 5.75 | | | |
| Lime, short ton | 22.74 | 21.46 | 23.67 | 24.45 | 19.41 |
| Salt, do | 9.64 | 9.60 | 11.20 | 10.71 | 10.19 |
| Sand, do | 1.21 | 1.05 | 1.07 | 1.27 | .76 |
| Gravel, do | 1.81 | 1.13 | 2.53 | 1.73 | 1.51 |
| Stone: | | | | | |
| Basalt, do | 1.55 | | | | |
| Granite, crushed and broken, do | 1.00 | 1.00 | | | |
| Limestone: | | | | | |
| Crushed and broken, do | 2.74 | 1.90 | [2] 1.37 | [2] 1.37 | [2] 1.21 |
| Dimension, do | 1.60 | 2.04 | 2.12 | 2.18 | 1.90 |
| Sandstone, crushed and broken, do | | | 2.13 | | |
| Miscellaneous stone: | | | | | |
| Crushed and broken, do | 2.33 | 1.70 | 2.42 | | |
| Dimension, do | | | 1.09 | | |
| Virgin Islands: Stone, miscellaneous, crushed and broken, short ton | 4.02 | 4.25 | 4.35 | 5.60 | 2.76 |

[1] For greater detail on prices, by grades and markets, see vol. I, Minerals Yearbook, 1956.
[2] Includes limestone used for cement and lime.

## REVIEW BY MINERAL COMMODITIES

**Cement.**—In 1956 cement remained the most important mineral commodity, with production comprising 86 percent of the island's total mineral value. Portland-cement shipments increased slightly as industrial construction continued active. Ponce Cement Corp. put a bulk cement carrier into operation to carry cement between Ponce and Port Everglades, Fla. The ship, reportedly the first vessel to be equipped with mechanical devices utilizing air slides instead of screw-type conveyors to carry cement to the hoppers, can transport approximately 9,000 long tons of cement, which can be unloaded in 16 hours.[4]

**Clays.**—Clay was used primarily in the production of cement in 1956. Miscellaneous clay and plastic-fire clay used to manufacture heavy clay products were produced near Carolina in San Juan District. Miscellaneous clay used to make commercial studio pottery, was produced in Hato Rey in San Juan District. Total production was slightly greater than in 1955.

[3] Petroleum Week, vol. 1, No. 24, Dec. 23, 1955, p. 20.
[4] Pit and Quarry, vol. 49, No. 4, October 1956, p. 48.

Digitized by Google

**Lime.**—The 1956 output of lime was slightly less than 1955. The raw-sugar industry continued as the principal market for lime produced from very pure limestone. Lime was produced in Humacao and Mayaguez Districts.

**TABLE 3.—Portland cement produced and shipped in Puerto Rico, 1947–51 (average), 1952–56, and total 1939–56, in 376-pound barrels**

| Year | Production (barrels) | Shipments | | |
|---|---|---|---|---|
| | | Barrels | Value | |
| | | | Total | Average per barrel |
| 1947–51 (average) | 2, 793, 182 | 2, 800, 220 | $7, 589, 397 | $2. 71 |
| 1952 | 4, 088, 199 | 3, 994, 483 | 10, 517, 894 | 2. 63 |
| 1953 | 3. 655, 614 | 3, 641, 135 | 9, 335, 421 | 2. 56 |
| 1954 | 3, 600, 064 | 3, 682, 187 | 9, 663, 445 | 2. 62 |
| 1955 | 4, 193, 592 | 4, 116, 739 | 12, 506, 784 | 3. 04 |
| 1956 | 4, 234, 284 | 4. 254, 701 | 14, 064, 982 | 3. 31 |
| 1939–56 | 40, 749, 653 | 40, 675, 856 | 109, 051, 803 | 2. 68 |

**Salt.**—The 1956 production of salt in Puerto Rico totaled 10,000 tons valued at $101,000. All production occurred in Mayaguez District by the evaporation of sea water.

**Sand and Gravel.**—Sand and gravel was obtained from rivers and beaches in all parts of the island and was used mainly in construction as concrete aggregate. High-silica sand was produced for use by the glass and ceramic industries and as an abrasive in the polishing of imported marble.

**Stone.**—Dimension limestone was quarried in 5 of the 7 districts in 1956. Tonnage and value were less than in 1955. Crushed limestone was produced in each of the 7 districts, with output and value greater than in 1955. Dimension stone was used in rough construction and as rubble, and crushed stone was used mainly for aggregate.

**TABLE 4.—Stone sold or used by producers in Puerto Rico, 1952–56**

| Year | Dimension limestone | | Crushed limestone | | Other stone [1] | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | 13, 684 | $21, 866 | 605, 830 | $1, 659, 910 | 69, 806 | $125, 612 | [2] 689, 320 | [2] $1, 807, 388 |
| 1953 | 16, 552 | 33, 733 | 631, 848 | 1, 203, 503 | (3) | (3) | [2] 648, 400 | [2] 1, 237, 236 |
| 1954 | 99, 889 | 211, 476 | [4] 1, 639, 684 | [4] 2, 252, 812 | 12, 423 | 28, 539 | [2] [4] 1, 751, 996 | [2] [4] 2, 492, 827 |
| 1955 | 86, 077 | 187, 842 | [4] 1, 697, 833 | [4] 2, 327, 918 | ---------- | ---------- | [4] 1, 783, 910 | [4] 2, 515, 760 |
| 1956 | 75, 168 | 142, 626 | [4] 2, 001, 285 | [4] 2, 412, 959 | ---------- | ---------- | [4] 2, 076, 453 | [4] 2, 555, 585 |

[1] Includes basalt, granite, sandstone, miscellaneous stone.
[2] Excludes crushed basalt (1952), crushed granite and miscellaneous stone (1953), and crushed sandstone (1954).
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Includes limestone for cement and lime.

Digitized by Google

## REVIEW BY DISTRICTS

**Aguadilla.**—Limestone and sand and gravel were produced in Aguadilla District in 1956. Limestone was crushed for use as concrete and road metal by General Builders Supplies, Inc., Rafael Falcon, Luis Viera, and Victoria Medina. Dimension limestone was quarried by Eugenio Natali and Rafael Falcon. Sand and gravel for molding, building, and paving was obtained by F. J. Rosello, General Builders Supplies, Inc., and Luis Bobadilla.

**Arecibo.**—Pedro Vega Santos quarried dimension limestone for rough construction purposes. Crushed limestone was produced by Severo O'Neil, Cantera De Casanovas, and Pedro Vega Santos. Compania de Ing y Contratistas produced paving gravel and crushed limestone. Rosario Rosario obtained gravel for paving purposes.

**Guayama.**—Cantera Bobadilla and Jose Rodriguez quarried and crushed limestone. Francisco Navarro produced crushed limestone and building sand and gravel. Limestone was used for concrete and road metal.

**Humacao.**—Limestone was quarried for use in manufacturing lime by Planta de Cal "Hicaco," Inc. Crushed limestone for concrete and road metal was produced by Ramon Rivera Figueroa, Mateo Perez Sanjurjo, Fajardo Sugar Co., and Cantera Perez. Cantera Perez also produced dimension limestone for use in rough construction and as rubble.

**TABLE 5.—Value of mineral production in Puerto Rico, by Districts, 1955–56**

| District | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Aguadilla | $125,632 | $218,706 | Stone, sand and gravel. |
| Arecibo | 68,613 | 141,298 | Do. |
| Guayama | 142,559 | 41,140 | Do. |
| Humacao | 412,163 | 189,411 | Lime, stone. |
| Mayaguez | 497,275 | 607,764 | Stone, salt, lime, sand and gravel. |
| Ponce | 7,908,072 | 8,330,023 | Cement, stone, sand and gravel. |
| San Juan | 5,453,189 | 6,866,697 | Cement, stone, sand and gravel, clays. |
| Undistributed | 309,232 | | |
| Total | 14,917,000 | 16,395,000 | |

**Mayaguez.**—Salt was produced from sea water by Puerto Rico Salt Works, Inc., at Boqueron, Providence, and Cabo Rojo; Carlos M. Ramirez Acosta at Saline Fortuna; Salina del Papayo, Inc.; and Productos Salinos, Inc. Liborio Lopez Sanchez produced glass and other sands; dimension limestone for rubble; and crushed limestone for concrete and road metal, riprap, and for the South Puerto Rico Sugar Co. to use in refining sugar and producing lime. Demetrio Rodriguez quarried dimension limestone for use in rough construction and as rubble. Leading crushed limestone producers included Waldemar Bravo, Cantera Bernat, Julio Agrait, and Cantera Santos. Conrado Forestier produced miscellaneous stone. Sucesion Lluberas obtained building and other sands and paving gravel from local deposits.

Digitized by Google

**Ponce.**—Portland cement was produced from local limestone quarries by the Ponce Cement Corp. at its Ponce plant. Jose A. Vallejo produced paving and other gravel and crushed limestone for concrete and road metal. Cement Products Corp., Ismael Torruellas, and Antonio Padilla quarried and crushed limestone for concrete and road metal.

**San Juan.**—Puerto Rico Cement Corp. quarried limestone for production of portland cement at its Guaynabo plant. Undressed dimension limestone was quarried by Cantera Ferrer for rough architectural purposes and Federico Gonzalez for rough construction purposes. Puerto Rico Clay Products, Inc., obtained shale and plastic fire clay from local deposits for manufacturing heavy clay products. The Puerto Rico Pottery produced miscellaneous clay for manufacturing studio pottery. Crushed limestone was produced for concrete and road metal. Leading producers included Cantera Diaz, Ramos Hermanos, Inc., Xavier Zequeira, Cantanen Hnos., and J. Ortiz Toro.

## PANAMA CANAL ZONE

The mineral industry of the Canal Zone includes the production of stone and sand and gravel. Total value of mineral production in 1956 was less than 1955 production, mainly owing to the lower unit value of stone in 1956.

### REVIEW BY MINERAL COMMODITIES

**Basalt.**—Basalt was quarried and crushed for concrete and road metal by the Panama Canal Co.

**Sand and Gravel.**—Panama Sand Co. produced sand from local deposits for building and paving.

**Stone.**—The United States Army—Caribbean quarried and crushed miscellaneous stone for concrete, road metal, and riprap.

**TABLE 6.—Crushed basalt and miscellaneous stone sold or used by producers in the Panama Canal Zone, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 99,540 | $155,760 | 1954 | 187,446 | $245,170 |
| 1952 | 86,000 | 152,000 | 1955 | 169,485 | 239,280 |
| 1953 | 171,908 | 231,752 | 1956 | 177,250 | 229,750 |

**TABLE 7.—Sand and gravel sold or used by producers in the Canal Zone, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 38,560 | $49,840 | 1954 | | |
| 1952 | 56,600 | 53,000 | 1955 | 35,910 | $47,229 |
| 1953 | 85,914 | 95,500 | 1956 | 40,095 | 48,673 |

Digitized by Google

# VIRGIN ISLANDS

The mineral industry of the Virgin Islands is limited to the production of stone.

## REVIEW BY MINERAL COMMODITIES

**Basalt.**—Basalt was quarried and crushed on St. Croix Island by the Government of the Virgin Islands, Hams Bay Crushing plant, and Springfield Crushing plant and used for concrete and road metal.

**TABLE 8.—Crushed miscellaneous stone sold or used by producers in St. Croix Island, Virgin Islands, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 6,635 | $14,550 | 1954 | [1] 3,939 | $17,134 |
| 1952 | 3,800 | 16,150 | 1955 | [1] 875 | 4,900 |
| 1953 | 10,789 | 45,853 | 1956 | [1] 11,591 | 31,963 |

[1] Basalt.

Digitized by Google

# The Mineral Industry of Rhode Island

By Joseph Krickich[1] and Geraldine C. Slaypoh[2]

THE MINERAL output of Rhode Island decreased 11 percent in value in 1956 compared with 1955. The decline was primarily due to limited highway construction by Government-and-contractor operations with a resulting drop in paving sand and gravel production. Sand and gravel, stone, and graphite, in order of decreasing value, were the only mineral commodities produced during 1956. Production was recorded in all counties except Bristol. Providence County continued as the major mineral-producing area.

**TABLE 1.—Value of mineral production in Rhode Island, 1955–56, by counties[1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Kent | $499,761 | $570,382 | Sand and gravel. |
| Newport | (2) | 63,320 | Sand and gravel, stone. |
| Providence | 1,152,137 | 953,222 | Sand and gravel, stone, graphite. |
| Washington | (2) | 40,160 | Sand and gravel. |
| Undistributed | 182,586 | ---- | |
| Total | 1,834,000 | 1,627,000 | |

[1] No production was reported from Bristol County.
[2] Value included with "Undistributed."

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Graphite.**—Natural amorphous graphite was recovered from a former meta-anthracite coal mine in Providence County. The graphite was used in preparing foundry facings and paint pigments.

**Sand and Gravel.**—The production and value of sand and gravel declined 33 percent and 16 percent, respectively, in 1956 as compared with 1955 owing to fewer Government contracts for road construction. During 1956 the production of paving, molding, structural, fire or furnace, and other sand, as well as paving, structural, and other gravel, was reported from various operations in the State. Kent County yielded 48 percent of the total sand and gravel production in the State and replaced Providence County as the largest sand and gravel producing area. During the year Government-contract operators were active only in Providence County.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

**Stone.**—Granite, limestone, and miscellaneous stone continued to be the varieties of stone produced in Rhode Island. During 1956 decline in demand for crushed stone as concrete aggregate and roadstone brought a moderate decrease in Rhode Island stone production. In addition to the production of crushed stone for concrete aggregate and roadstone, stone was quarried for metallurgical, agricultural, and other uses. Three quarries were in operation during the year; 2 in Providence County and 1 in Newport County.

## REVIEW BY COUNTIES

**Kent.**—Sand and gravel was the only mineral commodity produced in Kent County in 1956 and was used principally for structural and paving purposes. Producers were Rhode Island Sand & Gravel Co. and Luigi Vallone, Inc., Warwick; Whitehead Bros., Washington; Barber Sand & Gravel, Coventry; and John J. McHale & Sons, Inc., General Road Trucking, and Pawtucket Ready Mix.

**Newport.**—Callan Construction Corp. produced paving sand and gravel from a fixed preparation plant near Portsmouth. The company was idle during part of the year. From an open stone quarry near Middletown, Peckham Bros. Co., Inc., produced a conglomerate used as concrete aggregate and roadstone.

**Providence.**—Graphite, sand and gravel, and stone were produced in Providence County in 1956. Producers of sand and gravel were M. A. Gammino Construction Co. and A. Cardi Construction Co., Inc., both of Cranston; Del Bonis Sand & Gravel, Knightsville; Courtois Sand & Gravel Co., Central Falls; Tasca Sand & Gravel Co., Smithfield; Town Line Sand & Gravel, Slatersville; Valley Cement Block Co., Providence; Cormier Sand & Gravel Co.; Izzo Construction Co.; Mack Construction Co.; Morse Sand & Gravel Co.; and Silvestri Bros. Also, sand and gravel was produced under contract to the Division of Roads and Bridges, Department of Public Works of the State of Rhode Island.

Limestone for blast-furnace flux, agricultural purposes, filter beds, and cement was obtained from the Conklin quarry of the Conklin Limestone Co., Inc., near Lincoln. Fanning & Doorley Construction Co., Inc., Berkeley, produced crushed granite for concrete and road material.

Graphite Mines, Inc., continued to operate its natural amorphous graphite mine.

**Washington.**—The only mineral commodity produced in Washington County in 1956 was sand and gravel. Building and paving sand and gravel were produced by Louis B. Shaeffer and South County Sand & Gravel Co., both near Peace Dale; Elisha Taylor, West Kingston; and E. R. Viera.

Digitized by Google

# The Mineral Industry of South Carolina

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of South Carolina.**

By James L. Vallely [1] and Laurence L. Smith [2]

SOUTH CAROLINA mineral production was valued at $21.3 million in 1956—an increase of $1.1 million (6 percent) above 1955. Initial production of monazite and titanium concentrates, with gains in cement, sand and gravel, and stone, contributed the increased production value. Barite, kyanite, and vermiculite also added to the increase; clays were substantially the same as in 1955, and mica production declined.

**TABLE 1.—Mineral production in South Carolina, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 1,086,492 | $5,463,179 | 1,087,408 | $5,450,685 |
| Mica (sheet)—pounds | 909 | 9,309 | 5,400 | 13,784 |
| Sand and gravel | 3,126,952 | 2,677,054 | 3,228,740 | 2,925,902 |
| Stone | 3,455,388 | 4,920,697 | [2] 3,304,484 | [2] 4,285,383 |
| Titanium concentrates | ---------- | ---------- | 2,592 | 326,283 |
| Value of items that cannot be disclosed: Barite, cement, kyanite, mica (scrap), rare-earth-metals concentrates (1956), stone (crushed limestone and dimension granite, 1956) and vermiculite | ---------- | 7,390,538 | ---------- | 8,950,180 |
| Total South Carolina [3] | ---------- | 20,197,000 | ---------- | 21,342,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes crushed limestone and dimension granite, value for which is included with "Items that cannot be disclosed."
[3] Total adjusted to eliminate duplicating value of clays and stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Knoxville, Tenn.
[2] State geologist, South Carolina Geological Survey, Columbia, S. C.



Digitized by Google

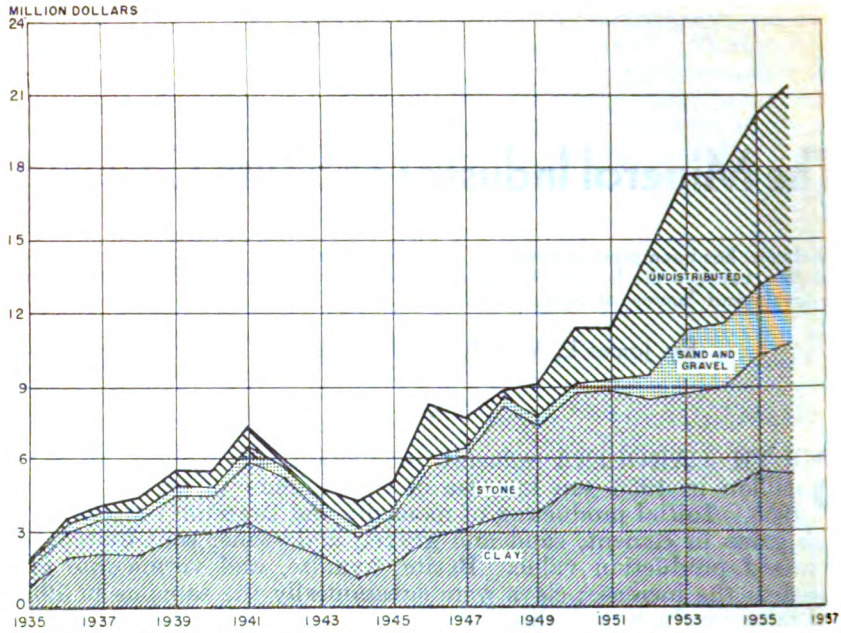



FIGURE 1.—Value of clay, stone, sand and gravel, and total value of mineral production of South Carolina, 1935–56.

**TABLE 2.—Average unit value of mineral commodities produced in South Carolina, 1948–51 (average), and 1952–56**

| Commodity | 1948–51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Barite short ton | $7.51 | $7.00 | $6.00 | $6.00 | $5.93 | $20.00 |
| Cement 376-pound barrel | 2.58 | 2.75 | 2.80 | 2.82 | 2.85 | 3.09 |
| Clays: | | | | | | |
| Fire short ton | 3.38 | 2.42 | 2.90 | | | |
| Kaolin do | 12.53 | 12.64 | 12.87 | 12.32 | 12.18 | 12.05 |
| Miscellaneous do | .86 | .93 | .84 | .83 | 1.13 | 1.05 |
| Kyanite do | 33.32 | 40.00 | 40.00 | 38.25 | 45.00 | 40.68 |
| Mica: | | | | | | |
| Scrap do | | | | 25.00 | 24.71 | 25.49 |
| Sheet pound | | | | 16.44 | 10.24 | 2.55 |
| Sand and gravel: | | | | | | |
| Gravel short ton | .93 | .79 | 1.16 | 1.30 | 1.23 | 1.29 |
| Sand do | .48 | .86 | .57 | .61 | .52 | .58 |
| Stone: | | | | | | |
| Granite (dimension) do | 34.29 | 39.39 | 39.39 | 16.15 | 21.34 | 21.34 |
| Granite (crushed) do | 1.31 | 1.31 | 1.35 | 1.37 | 1.33 | 1.30 |
| Limestone (crushed) do | 1.49 | 1.59 | 1.54 | 2.00 | 1.54 | 1.10 |
| Miscellaneous stone (crushed) short ton | .65 | .65 | | | | |
| Vermiculite do | 10.71 | 12.58 | 13.08 | 13.05 | 12.92 | 12.88 |

**Employment and Injuries.**—Reports submitted to the Bureau of Mines by producers indicate that employment in the mineral industries increased 14 percent over that in 1955. Employment more than doubled at nonmetal mines, declined 34 percent at quarries and mills, and increased 7 percent at sand and gravel mines.

Injuries were the same as in 1955. The frequency rate decreased 13 percent at nonmetal mines but increased 6 percent at quarries and mills. No fatal injuries occurred, compared with 1 in 1955.

Digitized by Google

TABLE 3.—Employment in the mineral industries, 1955–56

| Industry | 1955 | | | 1956 [1] | | |
|---|---|---|---|---|---|---|
| | Men working daily | Average active days | Man-days worked | Men working daily | Average active days | Man-days worked |
| Nonmetal mines | 237 | 261 | 61,761 | 580 | 269 | 155,730 |
| Quarries and mills | 550 | 261 | 143,727 | 349 | 270 | 94,382 |
| Sand and gravel mines [2] | 287 | 256 | 73,405 | 322 | 243 | 78,839 |
| Metal mines | 66 | 154 | 10,165 | | | |
| Total | 1,140 | 254 | 289,058 | 1,251 | 263 | 328,951 |

[1] Preliminary figures.
[2] Excluding Government-and-contractor operations.

TABLE 4.—Injuries in the mineral industries, 1955–56

| Industry | 1955 | | | | 1956 [1] | | | |
|---|---|---|---|---|---|---|---|---|
| | Fatal | Nonfatal | Total | Injuries per million man-days | Fatal | Nonfatal | Total | Injuries per million man-days |
| Nonmetal mines | | 16 | 16 | 259 | | 35 | 35 | 225 |
| Quarries and mills | 1 | 32 | 33 | 230 | | 23 | 23 | 244 |
| Metal mines | | 1 | 1 | 98 | | | | |
| Sand and gravel mines [2] | | | | | | | | |
| Total | 1 | 49 | 50 | 232 | | 58 | 58 | 232 |

[1] Preliminary figures.
[2] Not canvassed.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Titanium.**—Ilmenite and rutile concentrates were produced for the first time in South Carolina when Marine Minerals, Inc., began dredging [3] on Horse Creek near Aiken in 1955. Initial shipments were made in 1956, and ilmenite and rutile concentrates combined totaled 2,592 tons, valued at $326,000.

**Rare-Earth-Metals Concentrates.**—Monazite concentrate was produced as a coproduct with ilmenite and rutile concentrates by Marine Minerals, Inc., at the Horse Creek dredge and mill near Aiken.

### NONMETALS

**Barite.**—Industrial Minerals, Inc.—the only barite producer in the State—increased output at the Kings Creek mine.

**Cement.**—Carolina Giant Cement Co. operated its portland-cement plant at Harleyville (Dorchester County) throughout the year. Production was 1 percent above 1955.

**Clays.**—Clay production, including that used in cement, remained substantially the same as in 1955.

Kaolin for china, fillers, etc., increased 4 percent in tonnage and 2 percent in value. Refractory-kaolin production decreased 21 and 44

[3] Lenhart, Walter B., Rare Mineral Recovery Is the Main Business: Rock Products, vol. 9, No. 59, September 1956, pp. 52–69.

Digitized by Google

percent in tonnage and value, respectively. Total kaolin production was 2 percent higher in tonnage and rose 1 percent in value from 1955.

Miscellaneous clay, including clay used in cement, declined 1 percent in tonnage and 8 percent in value.

**TABLE 5.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds**

| Year | Kaolin | | Miscellaneous clay | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 300,031 | $3,642,122 | (1) | (1) | [2] 812,757 | [2] $4,083,001 |
| 1952 | 322,778 | 4,079,112 | 616,953 | $577,899 | [2] 947,278 | [2] 4,675,261 |
| 1953 | 327,594 | 4,213,431 | 621,554 | 544,415 | [2] 964,356 | [2] 4,801,921 |
| 1954 | 327,259 | 4,030,377 | 808,760 | 671,650 | 1,136,019 | 4,702,027 |
| 1955 | 383,402 | 4,668,598 | 703,090 | 794,581 | 1,086,492 | 5,463,179 |
| 1956 | 391,724 | 4,719,087 | 695,684 | 731,598 | 1,087,408 | 5,450,685 |

[1] Figure withheld to avoid disclosing individual company confidential data. Included with "Total."
[2] Includes a small quantity of fire clay.

**TABLE 6.—Kaolin sold or used by producers, 1955–56, by uses**

| Use | 1955 | 1956 | Use | 1955 | 1956 |
|---|---|---|---|---|---|
| | Short tons | Short tons | | Short tons | Short tons |
| Pottery and stoneware: Whiteware, etc. | 13,884 | 14,080 | Miscellaneous: Chemicals | 1,000 | 1,000 |
| Kiln furniture: Saggers, pins and stilts | 1,261 | (1) | Insecticides and fungicides | (1) | 33,102 |
| Architectural terra cotta | 2,500 | 2,327 | Plaster and plaster products | 7,689 | 7,517 |
| Rubber | 221,806 | 221,133 | Absorbent uses | (1) | 1,500 |
| Refractories: Fire brick and block | 15,261 | 12,619 | Other | 108,560 | 90,741 |
| Fire-clay mortar | 11,441 | 7,705 | Total | 383,402 | 391,724 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."

**Kyanite.**—Commercialores, Inc., at the Henry Knob mine in York County, was the only kyanite producer in South Carolina in 1956.

**Mica.**—Production of sheet mica in 1956 was 5,400 pounds valued at $14,000 compared with 900 pounds valued at $9,300 in 1955. Sheet mica was sold to the Government (GSA) Spruce Pine, (N.C.) Purchase Depot. Scrap-mica production declined 10 percent in tonnage and 7 percent in value from 1955. Production was reported from Abbeville, Anderson, Cherokee, Greenville, Lancaster, Oconee, and Saluda Counties.

**Sand and Gravel.**—Production of sand and gravel for sale or use by producers in 1956 was 3.2 million tons valued at $2.9 million—an increase of 3 percent in quantity and 9 percent in value. Sand rose 5 percent in tonnage and 16 percent in value; gravel increased only 1 percent in quantity but 6 percent in value. Twenty-eight commercial producers were active in 15 counties during the year. In addition, the South Carolina State Highway Department produced paving sand from 15 counties, totaling 38,000 tons valued at $15,000, compared with 30,000 tons valued at $9,000 in 1955.

Digitized by Google

**TABLE 7.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 405,546 | $191,438 | 1954 | 2,813,750 | $2,550,260 |
| 1952 | 1,048,099 | 892,312 | 1955 | 3,126,952 | 2,677,054 |
| 1953 | 2,975,608 | 2,564,484 | 1956 | 3,228,740 | 2,925,902 |

**TABLE 8.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Structural | 1,755,109 | $1,267,467 | [1] 1,018,419 | [1] $529,997 |
| Paving | 849,002 | 916,079 | 1,173,246 | 1,090,541 |
| Engine sand | 22,528 | 22,713 | [2] | [2] |
| Molding sand | 9,266 | 6,950 | | |
| Other | 491,047 | 463,845 | 1,037,075 | 1,305,364 |
| Total | 3,126,952 | 2,677,054 | 3,228,740 | 2,925,902 |

[1] Structural sand only; structural gravel included with "Other."
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Other."

**Stone.**— Total stone production in 1956 increased 16 percent in tonnage and 8 percent in value. Crushed granite rose 5 percent in quantity and 3 percent in value; dimension-granite production was substantially the same as in 1955. Limestone production, which included for the first time lime rock used in manufacturing cement, more than doubled from 1955 and increased in value 63 percent.

Granite was quarried in 5 counties: Fairfield, Lexington, Pickens, Richland, and Spartanburg. Cherokee and Dorchester counties produced limestone.

**TABLE 9.—Crushed stone sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Granite | | Limestone | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 2,165,641 | $2,820,663 | [1] | [1] | [1] | [1] |
| 1952 | 2,648,284 | 3,456,684 | 266,095 | $424,195 | [3] 2,914,839 | [3] $3,881,178 |
| 1953 | 2,660,989 | 3,587,827 | 252,871 | 388,543 | 2,913,860 | 3,976,370 |
| 1954 | 2,812,196 | 3,863,270 | 38,000 | 76,000 | [3] 2,861,953 | [3] 4,233,270 |
| 1955 | 3,146,989 | 4,172,329 | [1] | [1] | [1] | [1] |
| 1956 | 3,304,484 | 4,285,383 | [1] | [1] | [1] | [1] |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes a small quantity of miscellaneous stone.
[3] Incomplete figure; excludes a small quantity of miscellaneous stone.

**TABLE 10.—Crushed granite sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Concrete, roadstone, screenings | 2,454,759 | $3,365,337 | 2,704,589 | $3,819,944 |
| Railroad ballast | 519,269 | 696,662 | [1] | [1] |
| Other | 172,961 | 110,330 | 599,895 | 465,439 |
| Total | 3,146,989 | 4,172,329 | 3,304,484 | 4,285,383 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."

Digitized by Google

**Vermiculite.**—Crude-vermiculite production was 3 percent above 1955 in both tonnage and value. Zonolite Co. was the principal producer; Alabama Vermiculite Co. and American Vermiculite Co. mined smaller tonnages. The production came from Laurens County. Zonolite Co. also operated an exfoliating plant at Travelers Rest. Shipments of exfoliated vermiculite were 12 percent higher than in 1955.

## REVIEW BY COUNTIES

Mineral production was recorded in 32 of the 46 counties in South Carolina. Aiken and Dorchester Counties furnished more than 50 percent of total mineral-production value; Fairfield, Lexington, Richland, Marlboro, and Pickens Counties each produced more than $1 million, following in that order. Other important producing counties were Cherokee, Lancaster, Laurens, Spartanburg, Sumter, and York.

**TABLE 11.—Value of mineral production in South Carolina, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Abbeville | (2) | (2) | Mica. |
| Aiken | $4,671,429 | $5,292,240 | Kaolin, titanium concentrates, monazite, sand and gravel, miscellaneous clay. |
| Anderson | (2) | 1,757 | Mica, sand and gravel. |
| Bamberg | (2) | (2) | Sand and gravel. |
| Calhoun | 55 | 65 | Do. |
| Charleston | (2) | (2) | Do. |
| Cherokee | (2) | (2) | Limestone, barite, sand and gravel, mica. |
| Chester | 580 | 900 | Sand and gravel. |
| Chesterfield | (2) | 289,402 | Do. |
| Dorchester | (2) | (2) | Cement, limestone, miscellaneous clay, sand and gravel. |
| Fairfield | (2) | (2) | Granite, miscellaneous clay. |
| Florence | (2) | (2) | Sand and gravel. |
| Greenville | (2) | 45,082 | Sand and gravel, mica. |
| Greenwood | 27,000 | 27,186 | Miscellaneous clay. |
| Horry | (2) | (2) | Sand and gravel. |
| Jasper | (2) | (2) | Do. |
| Kershaw | 45 | 2,000 | Do. |
| Lancaster | (2) | (2) | Mica, miscellaneous clay. |
| Laurens | (2) | (2) | Vermiculite. |
| Lee | 25 | ---- | |
| Lexington | (2) | (2) | Granite, sand and gravel. |
| Marion | (2) | 24,034 | Miscellaneous clay, sand and gravel. |
| Marlboro | (2) | (2) | Sand and gravel, miscellaneous clay. |
| Oconee | 2,822 | 3,538 | Sand and gravel, mica. |
| Orangeburg | 925 | 400 | Sand and gravel. |
| Pickens | (2) | (2) | Granite. |
| Richland | 1,014,266 | 1,113,551 | Granite, miscellaneous clay, kaolin, sand and gravel. |
| Saluda | (2) | (2) | Mica. |
| Spartanburg | (2) | (2) | Granite, sand and gravel. |
| Sumter | (2) | (2) | Sand and gravel. |
| Union | 7,188 | 100 | Do. |
| York | (2) | (2) | Kyanite, sand and gravel. |
| Undistributed | 14,472,665 | 14,541,745 | |
| Total | 20,197,000 | 21,342,000 | |

[1] The following counties are not listed because no production was reported: Allendale, Barnwell, Beaufort, Berkeley, Clarendon, Colleton, Darlington, Dillon, Edgefield, Georgetown, Hampton, McCormick, Newberry, and Williamsburg.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Digitized by Google

**Abbeville.**—L. C. Clinkscales mined and sold hand-cobbed mica to the Government (GSA) Spruce Pine (N. C.) Purchase Depot.

**Aiken.**—Aiken ranked as the second most important mineral-producing county in the State; production, valued at $5.3 million, increased 13 percent over 1955, owing principally to initial production of heavy mineral concentrates and greater sand and gravel output.

Marine Minerals, Inc., began dredging at its Horse Creek mine in 1955 and in 1956 shipped monazite, ilmenite, and rutile concentrates.

The following 6 companies produced kaolin at 10 mines: Bell Clay Co. (Batesburg mine), Dixie Clay Co. (McNamee mine), J. M. Huber Corp. (Barden and Paragon mines), International Clay Co., National Kaolin Products Co. (Aiken mine), and Southeastern Clay Co. (Toole, Rodgers, Johnson and Flock mines). Georgia-Carolina Brick Co. mined shale for use in manufacturing heavy clay products. Augusta Sand & Gravel Co. and Perry Minerals Co., Inc., produced sand and gravel. The latter company production was obtained as a byproduct in dredging and concentrating heavy-mineral sands at the Horse Creek mine. The South Carolina State Highway Department mined paving sand for its own use.

**TABLE 12.—Kaolin sold or used by producers in Aiken County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 298,795 | $3,829,588 | 1954 | 307,816 | $3,973,970 |
| 1952 | 311,512 | 4,034,048 | 1955 | 356,911 | 4,575,877 |
| 1953 | 327,694 | 4,213,431 | 1956 | 370,858 | 4,667,001 |

**Anderson.**—Jesse D. Holland mined sheet mica, and the State highway department mined a small quantity of paving sand.

**Bamberg.**—Colleton Sand & Silica Co. mined and marketed building sand. Production was estimated to equal that in 1955.

**Calhoun.**—The State highway department produced a small quantity of paving sand.

**Charleston.**—Edisto Sand & Gravel Co. mined building sand, and the Sandrying Co. produced silica fillers.

**Cherokee.**—Industrial Minerals, Inc., mined barite at Kings Creek. Campbell Limestone Co. quarried crushed limestone at Blacksburg for concrete aggregate, roadstone, and agricultural stone. Paul K. Hines produced hand-cobbed mica. Jobe Sand Co. and the State highway department mined engine and paving sand, respectively.

**Chester.**—A small quantity of paving sand was produced by the State highway department.

**Chesterfield.**—W. R. Bonsal Co. and the State highway department produced sand and gravel for structural and paving uses.

**Dorchester.**—Dorchester County led South Carolina in value of mineral products and gained 5 percent over 1955. Carolina Giant Cement Co. mined clay and limestone and manufactured portland

Digitized by Google

cement at its Harleyville plant. Salisbury Brick Corp. mined clay for use in manufacturing heavy clay products at Summerville. Volunteer Portland Cement Co. took over the Carolina Cement & Lime Co. at the end of 1955 and continued to produce agricultural limestone in 1956. Hayes Sand Co. and Murray Sand Co. mined structural sand for the first time in 1956.

**Fairfield.**—The county ranked third in value as a mineral producer in South Carolina. Richland Shale Products Co. mined shale for use in its clay-products plant. Palmetto Quarries Co. crushed granite for railroad ballast and stone sand, and Rion Crushed Stone Corp. crushed granite for concrete and roadstone. Winnsboro Granite Co. was the only producer of dimension granite in the State.

**Florence.**—Sand was the only mineral produced in Florence County. Producers were: Coastal Sand Co. (Johnsonville), structural and paving sand; and Thomas Wall Sand Co. (Marion), structural sand only.

**Greenville.**—Southern Mining Co. produced hand-cobbed mica from the Briggs mine valued at $11,300. Five operators produced sand totaling 76,000 tons valued at $34,000. E. C. Cooper Sand Co. (Easley) and R. G. Garrison and Rogers Sand-Stone Co (Greenville) mined structural sand; James F. Zupan (Greenville), produced structural and paving sand; and the State highway department produced paving sand.

**Greenwood.**—Angus Brick & Tile Co. and Southern Brick Co. mined 101,000 tons of miscellaneous clay for heavy clay products.

**TABLE 13.—Miscellaneous clay sold or used by producers in Greenwood County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 70,750 | $58,156 | 1954 | 84,000 | $63,000 |
| 1952 | 69,275 | 52,956 | 1955 | 100,000 | 27,000 |
| 1953 | 65,000 | 49,662 | 1956 | 100,690 | 27,186 |

**Horry.**—The Dobbs Co. dredged building sand at Myrtle Beach, and E. P. Pitts Co. produced sand from the Pitts mine at Nichols; production was more than 40 percent above 1955.

**Jasper.**—Deerfield Sand Co. was the only mineral producer in the county in 1956.

**Kershaw.**—The State highway department produced 2,500 tons of paving sand.

**Lancaster.**—Ashe Brick Co. produced clay at its Van Wyck pit for use in its brick plant, and The Mineral Mining Corp. mined and processed sericite (scrap mica) near Kershaw.

**Laurens.**—Vermiculite was the only mineral produced in Laurens County in 1956. The Zonolite Co. was the principal producer; others were the Alabama Vermiculite Co. and the American Vermiculite Co.

**Lexington.**—Production of sand in 1956 was 580,000 tons—8 percent lower in tonnage than in 1955. Ninety-three percent of the total tonnage was marketed as building and paving sand, the remainder composing blast, fire or furnace, engine and filter sands, and fertilizer filler. Producers were: Capitol Sand Co., Columbia Silica & Sand Co., Foster Bros. Dixiana Sand Co., and Southern

Digitized by Google

Silica Mining & Mfg. Co., all of Columbia; Southeastern Sand Co., Cayce; and the State highway department. Weston and Brooker Quarry Co. produced crushed granite at the Cayce quarry. Production was substantially the same as in 1955.

**TABLE 14.—Sand sold or used by producers in Lexington County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average) | 203,151 | $101,605 | 1954 | 576,970 | $276,129 |
| 1952 | 240,322 | 132,431 | 1955 | 633,528 | 256,750 |
| 1953 | 632,497 | 295,528 | 1956 | 579,838 | 254,629 |

**Marion.**—J. D. Murchison mined miscellaneous clay for building brick at Pee Dee. Sandy Bluff Sand Co. produced building sand at Mullins.

**Marlboro.**—Cheraw Brick Works, Inc., and Palmetto Brick Co. (both of Cheraw) mined 143,000 tons of miscellaneous clay for use in their brick plants. Becker County Sand & Gravel Co. produced sand and gravel for railroad ballast, building, and paving uses. Lawrence Stone & Gravel Co. mined building sand.

**Oconee.**—Swain Black (Shirley mine) and Benny Mason (Kelly mine) produced a small amount of sheet mica. The State highway department mined paving sand.

**Orangeburg.**—The State highway department mined a small quantity of paving sand.

**Pickens.**—Campbell Limestone Co. crushed granite at the Beverly quarry for concrete aggregates, roadstone, and riprap; production was somewhat below that in the peak year 1955.

**Richland.**—Clay production declined 14 percent in tonnage and 28 percent in value from 1955. Carolina Ceramics, Inc., and Columbia Pipe Co. mined kaolin and miscellaneous clay for use in firebrick, building brick, and other heavy clay products. R. M. Stork Fire Brick Works mined and used kaolin, and the Guignard Brick Co. mined and used miscellaneous clay. Harrison Sand Corp. mined structural sand, and Strickland Sand Pit mined sand for structural and paving uses. Palmetto Quarries Co. surpassed its previous peak production of 1954 and crushed granite for aggregates, roadstone, and railroad ballast.

**Saluda.**—Kings Mountain Mica Co., Inc., produced scrap mica from a mica-schist deposit, which was mined out and abandoned at the end of the year.

**Spartanburg.**—Campbell Limestone Co. crushed granite at the Pacolet quarry for riprap, railroad ballast, concrete, and roadstone. The State highway department produced 2,000 tons of paving sand.

**Sumter.**—Becker Sand & Gravel Co. again increased its annual production of sand and gravel at the Camden mine, and the State highway department mined a small tonnage of paving sand.

**Union.**—The only mineral production in the county in 1956 was 200 tons of paving sand mined by the State highway department.

**York.**—Commercialores, Inc., mined kyanite at the Henry Knob mine near Clover. The State highway department mined 1,000 tons of paving sand.

465877—58——65

Digitized by Google

Digitized by Google

# The Mineral Industry of South Dakota

**This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the South Dakota State Geological Survey.**

By D. H. Mullen [1]

SOUTH DAKOTA mineral production in 1956 was valued at $41.8 million, a gain of 3 percent over 1955, continuing a steady upward trend for the fifth consecutive year. As in 1955, the nonmetals composed over half (51 percent) of the value. Metals, of which gold and silver represented 99 percent, accounted for 48 percent and fuels less than 1 percent.

Gains were recorded in value of gold, iron ore, cement, clays, feldspar, gem stones, gypsum, lime, mica, petroleum, and stone. Conversely, the value of beryl, columbite-tantalite, silver, sand and gravel, and coal declined.

The completion of the uranium-processing mill at Edgemont by Mines Development, Inc., was of major importance. The mill

**TABLE 1.—Mineral production in South Dakota, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Beryllium concentrate.....gross weight | 294 | $157,046 | 195 | $94,830 |
| Clays | (3) | (3) | [3] 201,129 | [3] 201,129 |
| Coal (lignite) | 25,782 | 90,240 | 24,519 | 89,761 |
| Columbium-tantalum concentrate.....pounds | 5,638 | 9,584 | 237 | 403 |
| Feldspar.....long tons | 42,164 | 267,286 | 45,226 | 288,843 |
| Gem stones | (4) | 7,400 | (4) | 10,000 |
| Gold (recoverable content of ores, etc.).....troy ounces | 529,865 | 18,545,275 | 568,523 | 19,898,305 |
| Gypsum | 12,592 | 16,369 | 15,794 | 63,176 |
| Iron ore (usable).....long tons, gross weight | 2,048 | (3) | 22,146 | 100,456 |
| Mica: | | | | |
| Scrap | 1,322 | 26,853 | 1,268 | 31,224 |
| Sheet.....pounds | 4,854 | 21,383 | 12,494 | 57,053 |
| Sand and gravel | 13,537,801 | 10,096,828 | 12,539,000 | 8,423,050 |
| Silver (recoverable content of ores, etc.) troy ounces | 154,092 | 139,461 | 136,118 | 123,194 |
| Stone | 2,262,246 | 5,679,444 | 2,200,421 | 5,724,758 |
| Value of items that cannot be disclosed: Bentonite (1956) cement, lime, petroleum, and values indicated by footnote 2 | ---------- | 6,114,433 | ---------- | 7,547,393 |
| Total South Dakota [5] | ---------- | 40,526,000 | ---------- | 41,797,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers); value of uranium ore is excluded.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[3] Excludes bentonite; value included with "Value of items that cannot be disclosed" to avoid disclosing individual company confidential data.
[4] Weight not recorded.
[5] Total adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.



Digitized by Google

began operation in July and processed ores from Wyoming as well as South Dakota. A Defense Minerals Exploration Administration (DMEA) contract to explore the Teepee uranium prospect was approved.

Exploration for petroleum was at a higher rate than in 1955, but no new discoveries were made.

Employment in the mining industry remained constnat at 2,500 men from 1954 through 1956. Contract-construction employment, which included (in part) contractors engaged in producing raw materials such as sand and gravel and crushed stone for road construction and similar projects, as well as building and other contractors, increased from 9,700 in 1954 to 10,000 in 1956.

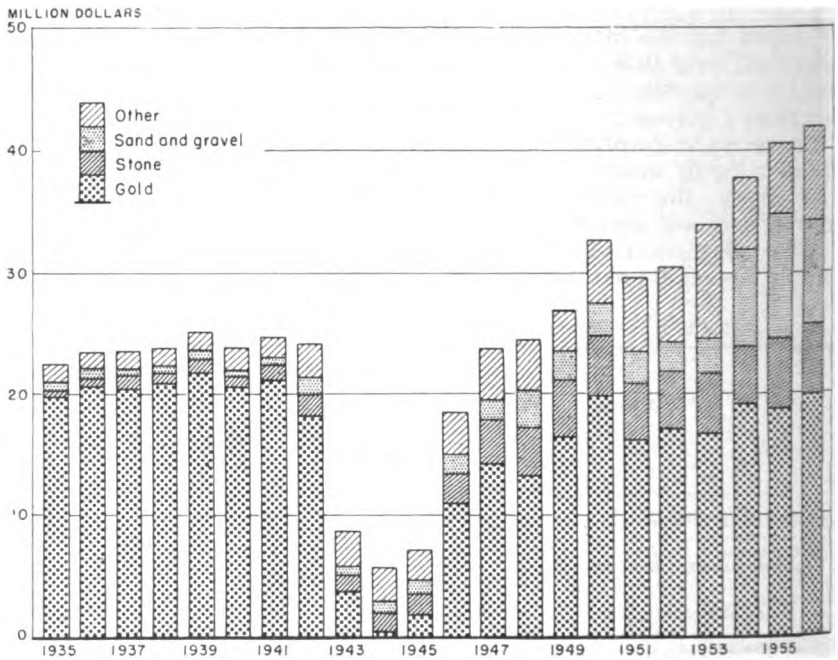



FIGURE 1.—Value of gold, dimension and crushed stone, sand and gravel, and total value of mineral production in South Dakota, 1935–56.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Beryllium.**—Beryllium concentrate (beryl) was recovered by hand cobbing from pegmatite dikes in Custer and Pennington Counties as a coproduct of feldspar and mica mining. Production in 1956 was 195 tons—a 34-percent decrease compared with 1955. The Government purchased 57 percent of the output through the GSA Custer (S. Dak.) Purchase Depot for stockpiling. Gladys Wells McKinley (Custer) purchased the remainder for resale to consumers. Pennington County produced 52 percent and Custer County 48 percent of the

Digitized by Google

total. Sales were reported by 108 companies, individuals, and combinations of individuals—79 in Custer County and 29 in Pennington County.

The Federal Bureau of Mines Rapid City Experiment Station continued to study methods of separating beryl, columbite-tantalite, and mica from pegmatite rock.

**Columbium (Niobium) Tantalum.**—Production of columbite-tantalite concentrate again declined in 1956. There was little or no output after purchases for the stockpile ceased when the quota established by the Congress was filled in 1955. On July 19, 1956, the Domestic Tungsten, Asbestos, Fluorspar, and Columbium-Tantalum Purchase Act of 1956 was signed by the President and the measure (S. 3982) became Public Law 733, 84th Congress, 2d session. The act provided for purchasing 250,000 pounds of columbium-tantalum-bearing concentrate at the same price and meeting the same specifications as were in effect December 1, 1955. Passage of the act did not result in immediate resumption of operations, and production in 1956 was 237 pounds—a decline of 96 percent compared with 1955. Sales were reported by 3 producers in Custer County and 1 in Pennington County.

**Gold and Silver.**—The Homestake Mining Co. and the Bald Mountain Mining Co. in Lawrence County, the only producers of gold and silver, furnished 99 percent of the value of all metals produced and 48 percent of the value of mineral production of South Dakota. Output of gold increased 7 percent and silver decreased 12 percent in 1956 compared with 1955. Homestake Mining Co. retained its position as the leading gold producer in the Nation.

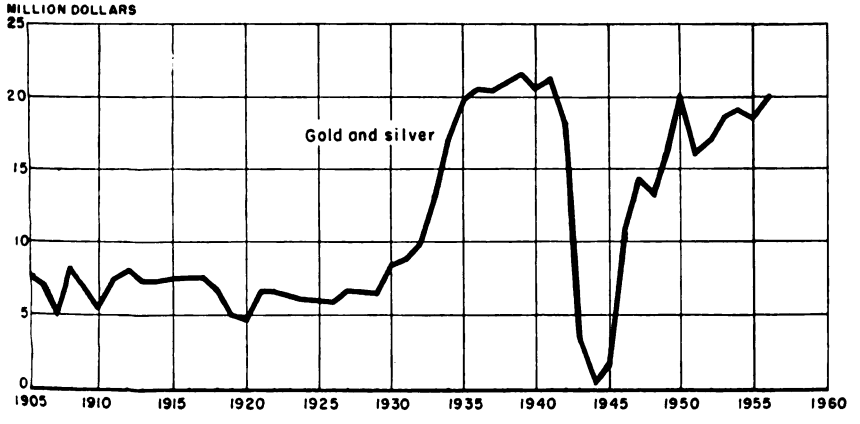



FIGURE 2.—Total value of mine production of gold and silver in South Dakota, 1905–56.

**Iron Ore.**—Iron ore from deposits on Strawberry Hill in Lawrence County was used in cement. Earlier, a deposit near Nemo, also in Lawrence County, was used for the same purpose. Ore from Strawberry Hill is softer, more easily crushed, higher grade, and more suitable for use in cement than that from Nemo, which is relatively hard

Digitized by Google

**TABLE 2.—Mine production of gold and silver in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Month | Gold (fine ounces) | Silver (fine ounces) |
|---|---|---|---|---|---|
| January | 41,057 | 9,965 | August | 50,601 | 11,681 |
| February | 42,337 | 10,546 | September | 50,725 | 12,030 |
| March | 45,294 | 11,293 | October | 46,554 | 10,318 |
| April | 44,671 | 10,924 | November | 50,761 | 11,497 |
| May | 47,109 | 12,322 | December | 46,123 | 10,718 |
| June | 51,727 | 12,512 | | | |
| July | 51,564 | 12,312 | Total | 568,523 | 136,118 |

**TABLE 3.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total 1876–1956, in terms of recoverable metals [1]**

| Year | Mines producing | | Material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 4 | 1 | 1,146,487 | 455,158 | $15,930,537 | 119,483 | $108,137 |
| 1952 | 6 | | 1,324,817 | 482,534 | 16,888,690 | 132,102 | 119,559 |
| 1953 | 4 | | 1,479,802 | 534,987 | 18,724,545 | 138,642 | 125,478 |
| 1954 | 2 | | 1,600,784 | 541,445 | 18,950,575 | 151,407 | 137,031 |
| 1955 | 2 | | 1,665,341 | 529,865 | 18,545,275 | 154,092 | 139,461 |
| 1956 | 2 | | 1,743,173 | 568,523 | 19,898,305 | 136,118 | 123,194 |
| 1876–1956 | | | [3] | 25,979,446 | 690,877,819 | 10,997,785 | 8,085,466 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | | | 6 | $1,998 | 10 | $2,462 | $16,043,134 |
| 1952 | | | 2 | 644 | | | 17,008,893 |
| 1953 | | | 10 | 2,620 | | | 18,852,643 |
| 1954 | | | | | | | 19,087,606 |
| 1955 | | | | | | | 18,684,736 |
| 1956 | | | | | | | 20,021,499 |
| 1876–1956 | 106 | $36,466 | 497 | 71,752 | 265 | 56,406 | 699,127,909 |

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailing or slime re-treated, and ore or old tailing shipped directly to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

**TABLE 4.—Gold and silver bullion produced at mills by amalgamation, 1947–51 (average) and 1952–56**

| Year | Material sold or treated (short tons) | Gold in bullion (fine ounces) | Silver in bullion (fine ounces) | Year | Material sold or treated (short tons) | Gold in bullion (fine ounces) | Silver in bullion (fine ounces) |
|---|---|---|---|---|---|---|---|
| 1947–51 (average) | 1,033,934 | 306,556 | 76,292 | 1954 | 1,485,226 | 363,831 | 80,168 |
| 1952 | 1,209,926 | 328,844 | 64,584 | 1955 | 1,550,116 | 379,249 | 76,312 |
| 1953 | 1,368,059 | 365,442 | 74,608 | 1956 | 1,627,719 | 404,525 | 80,044 |

and difficult to crush. Production in 1956 was 22,146 long tons, more than a 10-fold increase over 1955.

**Uranium.**—Exploration, development, and production of uranium ores in Fall River County continued throughout 1956. Uranium-

Digitized by Google

TABLE 5.—Gold and silver bullion produced at mills by cyanidation, 1947–51 (average) and 1952–56

| Year | Material treated (short tons) | | | Gold in bullion (fine ounces) | Silver in bullion (fine ounces) |
|---|---|---|---|---|---|
| | Crude ore | Sands and slimes | Total | | |
| 1947–51 (average) | 111,502 | 1,033,625 | 1,145,127 | 148,570 | 42,763 |
| 1952 | 114,863 | 1,209,884 | 1,324,747 | 153,690 | 67,183 |
| 1953 | 111,676 | 1,368,059 | 1,479,735 | 160,542 | 63,434 |
| 1954 | 115,558 | 1,485,226 | 1,600,784 | 177,614 | 71,239 |
| 1955 | 115,225 | 1,550,116 | 1,665,341 | 150,616 | 77,780 |
| 1956 | 115,454 | 1,627,719 | 1,743,173 | 163,998 | 56,074 |

bearing material was found in Custer and Pennington Counties, and some ore was produced. Exploration of uraniferous lignite beds in Harding County continued, and a small tonnage was shipped for test purposes. Although research continued on the problem of extracting uranium from the lignites, no economically suitable method had been developed by the end of the year. Exploration was done by rotary drilling (3,044 holes; 226,449 feet), wagon drilling (2,000 feet), drifting and crosscutting (3,480 feet), sinking and raising (481 feet), and stripping (5,000 cubic yards). Most of the exploration was in Fall River County, followed by Custer, Meade, and Harding Counties.

Mines Development, Inc., completed its 300-ton-a-day mill at Edgemont and began operations early in July.

Lucius Pitkin, Inc., operated the buying station at Edgemont as agents for the Atomic Energy Commission (AEC) from January 1 until July 1, when Mines Development, Inc., assumed operation of the facility. The AEC continued to investigate raw-materials resources from its suboffice at Rapid City.

From July 1, 1955, to June 30, 1956, 23,884 tons of uranium ore averaging 0.19 percent uranium oxide was delivered to the buying station from South Dakota operations. The calculated value (f. o. b. mine value equivalent of base price plus grade premium plus development allowance—AEC Circular 5, revised) was $328,861. Because of incomplete figures for the calendar year 1956, this value was not included in the mineral production of the State shown in table 1.

Experiments to develop a method for extracting uranium from uraniferous lignite were made by the AEC at Grand Junction, Colo., where a pilot plant was built. The uranium minerals were readily leached with sulfuric acid, but filtering of the residue by conventional milling methods presented a major problem, as yet unsolved. Further work was directed toward a process consisting of roasting the lignite at a temperature of 1,200° to 1,500° F. to remove interfering tars and oils and leaching the residue with acid to remove the uranium. Results of the work were not available at the end of the year.

A contract for exploring the Teepee uranium project in Fall River County was executed between DMEA and Uranium Research & Development Co. The amount of the contract was $29,140, of which the Government supplied 75 percent.

Digitized by Google

## NONMETALS

**Cement.**—The South Dakota Cement Plant at Rapid City, Pennington County, produced general-use and moderate-heat (types I and II), high-early-strength (type III), and high-sulfate-resistance (type V) portland cements; and masonry cement. Portland-cement clinker was used as a base in masonry cement. Shipments of portland cements and masonry cement in 1956 increased 11 and 1 percent, respectively, compared with 1955. The average price of portland and masonry cements in 1956 was $2.98 and $3.73 per barrel, respectively, compared with $2.84 and $3.56 in 1955.

**Clays.**—Bentonite was mined by one company in Butte County. Two plants at Belle Fourche processed crude bentonite, mainly from deposits in Crook County, Wyo. The processed product was utilized for rotary-drilling mud, in foundries and steel plants, as briquet binders, in animal feed, insulation, insecticides, concrete admixture, and filter-aids, and for export.

Miscellaneous clay was mined in Butte County for building brick, tile, and other heavy clay products and in Pennington County for cement and lightweight aggregate.

Production in 1956 increased 40 percent in quantity and 64 percent in value compared with 1955. A report [2] described the expansion of clays and shales from North and South Dakota.

**Feldspar.**—Feldspar (the major mineral product in most pegmatites) was mined in Custer and Pennington Counties. Nine operations, producing over 1,000 tons each, represented 64 percent of the total production. The remainder was produced by 118 companies, individuals, and combinations of individuals. The bulk of the output was produced and/or purchased by the Consolidated Feldspar Department, International Minerals & Chemical Corp., for grinding at its mills at Custer and Keystone, and at Denver, Colo. Production in 1956 increased 7 percent in quantity and 8 percent in value compared with 1955.

Ground feldspar from the mills at Custer and Keystone was used in pottery, glass, enamel, and soaps and abrasives.

**Gem Stones.**—Varieties of gem stones, including rose quartz, agatized and petrified wood, jasper, and agates, were collected in various areas of Custer and Pennington Counties. Prices varied from $0.50 a pound for rose quartz and jasper to $5 a pound for Fairburn agates. Most of the output was used for souvenirs and specimens; the better grades of agate were sold to polishers. Reported production in 1956 was 36 percent greater than that reported in 1955.

**Gypsum.**—Gypsum used in portland and masonry cements was mined from deposits in the Spearfish formation near Rapid City, Pennington County. Production in 1956 was 25 percent greater than in 1955.

**Lime.**—Quicklime, used within the State, for metallurgical purposes, was produced at Pringle, Custer County. Output in 1956 increased 11 percent compared with 1955.

**Mica.**—The quantity of sheet mica recovered from handcobbed mica in 1956 increased nearly threefold compared with 1955. Hand-

[2] Zetterstion, J. D., and Cole, W. A., Expansion of Clays and Shales from North and South Dakota: Bureau of Mines Rept. of Investigations 5202, 1956, 13 pp.

Digitized by Google

cobbed mica delivered to the Government Purchase Depot at Custer increased more than threefold over 1955. The recovery of block mica in 1956 was 5.64 percent compared with 7.16 percent in 1955. The recovery of Stained mica from total block mica processed increased from 40.06 percent in 1955 to 60.63 percent in 1956; during the same period the recovery of Good Stained and Better quality mica declined from 5.59 percent to 2.07 percent.

**TABLE 6.—Production of hand-cobbed mica and yield of sheet mica, 1954–56**

| Year | Hand-cobbed mica | Total block mica recovered | | Stained quality recovered | | Good Stained and Better quality recovered | |
|---|---|---|---|---|---|---|---|
| | Pounds | Pounds | Percent of hand cobbed | Pounds | Percent of total block | Pounds | Percent of total block |
| 1954 | 207,221 | 15,967 | 7.71 | 8,381 | 52.49 | 477 | 2.99 |
| 1955 | 64,673 | 4,633 | 7.16 | 1,856 | 40.06 | 259 | 5.59 |
| 1956 | 216,802 | 12,238 | 5.64 | 7,420 | 60.63 | 253 | 2.07 |

**TABLE 7.—Mica sold or used by producers, 1952–56**

| | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Hand-cobbed mica, total: Pounds | 84,846 | 227,847 | 207,221 | 64,673 | 216,802 |
| Sheet mica: [1] | | | | | |
| Uncut larger than punch and circle: | | | | | |
| Pounds | 490 | 921 | 332 | 221 | 256 |
| Value | $6,580 | $8,983 | $3,056 | $1,980 | $2,010 |
| Average per pound | $13.43 | $9.75 | $9.20 | $8.96 | $7.85 |
| From hand-cobbed mica: | | | | | |
| Pounds | 3,818 | 10,253 | 15,967 | 4,633 | 12,238 |
| Value | $25,454 | $68,369 | $62,166 | $19,403 | $55,043 |
| Average per pound | $6.67 | $6.67 | $3.89 | $4.19 | $4.50 |
| Total: | | | | | |
| Pounds | 4,308 | 11,174 | 16,299 | 4,854 | 12,494 |
| Value | $32,034 | $77,352 | $65,222 | $21,383 | $57,053 |
| Average per pound | $7.44 | $6.92 | $4.00 | $4.41 | $4.57 |
| Scrap mica, total: | | | | | |
| Short tons | 915 | 1,687 | 1,510 | 1,322 | 1,268 |
| Value | $24,148 | $27,388 | $26,943 | $26,853 | $31,224 |
| Average per ton | $26.39 | $16.23 | $17.84 | $20.31 | $24.62 |
| Total sheet and scrap mica: | | | | | |
| Short tons | 917 | 1,693 | 1,518 | 1,324 | 1,274 |
| Value | $56,182 | $104,740 | $92,165 | $48,236 | $88,277 |

[1] Purchased by GSA Custer (S. Dak.) Purchase Depot.

Mica was produced by 60 operators; the majority were in Custer County. Full-trimmed sheet mica was produced by 7 operators in Custer County; 1 also produced hand-cobbed mica and 5 also produced hand-cobbed and scrap mica. Hand-cobbed mica was produced by 30 operators; 7 also produced hand-cobbed and scrap mica, and 16 also produced scrap mica. Six producers operated deposits in both Custer and Pennington Counties. Scrap-mica production in 1956 decreased 4 percent in quantity but increased 16 percent in value compared with 1955.

**Sand and Gravel.**—Sand and gravel produced from commercial and Government-and-contractor operations in 1956 declined 7 percent

Digitized by Google

compared with 1955. The greatest decline—13 percent—was in commercial operations. Production was reported in 45 counties; 31 counties reported commercial production and 42 counties reported Government-and-contractor operations. Paving and road construction consumed 91 percent of the total output; of this, 88 percent was by Government-and-contractor operators. These operations accounted for 81 percent of the total sand and gravel produced.

Leading commercial producers included Batie Gravel Co., Birdsall Sand & Gravel Co., Hallet Construction Co., Hills Materials Co., and Dean R. Rounds. Principal Government-and-contractor operators were G. H. Lindekugel & Sons, Mannerud Bros., A. W. Schnuerle Construction Co., Floyd Stapp Construction Co., and Weelborg Bros.

**TABLE 8.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| Class of operation and use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 487,503 | $432,592 | $0.89 | 465,000 | $381,650 | $0.82 |
| Paving | 490,734 | 131,859 | .27 | 159,500 | 115,500 | .72 |
| Filter | | | | (1) | (1) | |
| Railroad ballast | | | | (1) | (1) | |
| Other | | | | (1) | (1) | |
| Gravel: | | | | | | |
| Building | 336,276 | 213,458 | .63 | 486,000 | 387,250 | .80 |
| Paving | 1,349,441 | 570,083 | .42 | 1,174,500 | 818,150 | .70 |
| Railroad ballast | 85,785 | 32,544 | .38 | 77,000 | 65,000 | .84 |
| Other | 494 | 718 | 1.45 | 4,000 | 2,250 | .56 |
| Undistributed [1] | | | | 22,500 | 24,250 | 1.08 |
| Total sand and gravel | 2,750,233 | 1,381,254 | .50 | 2,388,500 | 1,794,050 | .75 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 270 | 600 | 2.22 | | | |
| Paving | 535,124 | 633,598 | 1.18 | 3,500 | 2,250 | .64 |
| Gravel: | | | | | | |
| Building | 364,435 | 60,408 | .17 | 118,000 | 83,500 | .71 |
| Paving | 9,887,739 | 8,020,968 | .81 | 10,029,000 | 6,543,250 | .65 |
| Total sand and gravel | 10,787,568 | 8,715,574 | .81 | 10,150,500 | 6,629,000 | .65 |
| Grand total | 13,537,801 | 10,096,828 | .75 | 12,539,000 | 8,423,050 | .67 |

[1] Figures that may not be shown separately are combined as "Undistributed."

**Stone.**—In 1956, 7 operators in Grant County and 1 operator in Hughes County produced dimension granite for use in buildings and monuments. This was a decline of 6 percent in quantity and 4 percent in value compared with 1955. Of the 1956 production, 87 percent was used for monuments and 13 percent for building work. Stone quarried by 4 companies was finished at Minnesota plants.

Crushed limestone for use as riprap, concrete aggregate, and road material and in sugar, lime, and cement was produced in Custer, Lawrence, and Pennington Counties. Production in 1956 increased 55 percent in quantity and 58 percent in value compared with 1955.

Digitized by Google

Concrete aggregate and road material consumed 57 percent of the total production, reflecting the growing use of crushed stone in place of gravel for these purposes.

Crushed sandstone for riprap, concrete aggregate, road material, railroad ballast, refractory stone, filter medium, and foundry sand; and for use in ferrosilicon was produced in Hanson and Minnehaha Counties. A small quantity was produced in Pennington County for use as a roofing material. Output in 1956 increased 25 percent in quantity and 19 percent in value compared with 1955.

Miscellaneous crushed stone was used for concrete aggregate and road material and was produced in Beadle, Meade, and Lawrence Counties; 94 percent was supplied by Government-and-contractor operations. Production in 1956 decreased 70 percent compared with 1955.

### MINERAL FUELS

**Coal (Lignite).**—Coal (lignite) was produced at a strip mine in Dewey County. The entire output, which declined 5 percent in 1956 compared with 1955, was shipped to consumers by truck. Other mines in northwestern counties produced small quantities for local consumption.

**Petroleum.**—Production of crude petroleum in 1956 was derived from two wells in the Buffalo field in Harding County. Crude oil was transported by truck and railroad to the International refinery at Wrenshall, Minn. Production was slightly more than in 1955. Exploratory drilling increased in 1956; 37 wells were completed compared with 16 in 1955. None of the wells drilled in 1956 was successful; total drilling exceeded 100,000 feet. Three deep tests were completed in Harding County, and small quantities of oil were recovered in two wells. All were plugged and abandoned.

Geophysical (seismograph and gravimeter) work declined to 88 crew-weeks in 1956 compared with 128 crew-weeks in 1955. The major portion of the work was in Harding County (45 crew-weeks), followed by Meade County (14 crew-weeks), Fall River County (11 crew-weeks), and Perkins County (11 crew-weeks). Sun Oil Co. was the major operator, followed by Mobil Producing Co., The Texas Co., and Continental Oil Co.

## REVIEW BY COUNTIES

**Brookings.**—Brookings County led the State in the production of sand and gravel. Brookings Sand & Gravel Co. and Grant Vanden-Berg produced building sand and gravel. Mannerud Bros. produced paving gravel for the State highway commission, and the county highway department produced paving sand.

**Brown.**—The county ranked second in the State in the output of sand and gravel. Scattergood Sand & Rock Co. produced building sand and John Schnuerle produced paving gravel. Paving gravel was produced for the State highway commission by the A. W. Schnuerle Construction Co. The county highway department produced paving sand and gravel and let contracts for paving gravel to W. Hodgeman & Son, Loomis Bros., and Herman Pickus.

Digitized by Google

**Brule.**—Ed Cox & Son produced paving gravel for the county highway department. Brule County ranked fifth in the State in the output of sand and gravel.

**TABLE 9.—Value of mineral production (excluding uranium) in South Dakota, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Aurora | (2) | $29,000 | Sand and gravel. |
| Beadle | $46,629 | 58,509 | Sand and gravel, stone. |
| Bon Homme | 18,100 | 18,000 | Sand and gravel. |
| Brookings | 122,783 | 396,000 | Do. |
| Brown | 80,084 | 347,250 | Do. |
| Brule | | (2) | Do. |
| Buffalo | | 4,000 | Do. |
| Butte | 1,340,389 | (2) | Clays, sand and gravel. |
| Charles Mix | 6,499 | 61,500 | Sand and gravel. |
| Clark | 14,997 | 61,250 | Do. |
| Clay | 12,629 | 44,000 | Do. |
| Codington | 199,632 | 316,500 | Do. |
| Corson | 1,800 | | |
| Custer | 337,888 | 356,079 | Feldspar, mica, beryl, lime, sand and gravel, stone, gem stones, columbium-tantalum. |
| Davison | 32,961 | 34,750 | Sand and gravel. |
| Day | 22,538 | 36,500 | Do. |
| Deuel | 11,326 | 12,750 | Do. |
| Dewey | 90,240 | 89,761 | Coal. |
| Douglas | 15,505 | 35,000 | Sand and gravel. |
| Edmunds | 7,938 | | |
| Fall River | (2) | (2) | Sand and gravel. |
| Grant | 2,405,455 | 2,381,950 | Stone, sand and gravel. |
| Gregory | 20,165 | 50,500 | Sand and gravel. |
| Haakon | 8,000 | | |
| Hamlin | 83,539 | 59,250 | Sand and gravel. |
| Hand | 350 | 9,250 | Do. |
| Hanson | 359,566 | 499,804 | Stone. |
| Harding | (2) | (2) | Petroleum. |
| Hughes | (2) | (2) | Sand and gravel, stone. |
| Hutchinson | 26,499 | 40,500 | Sand and gravel. |
| Hyde | 894 | 7,500 | Do. |
| Jackson | 1,719 | | |
| Jerauld | (2) | 19,750 | Sand and gravel. |
| Kingsbury | 45,093 | (2) | Do. |
| Lake | 76,985 | 189,250 | Do. |
| Lawrence | 18,741,872 | 20,250,192 | Gold, silver, stone, iron ore, sand and gravel. |
| Lincoln | 82,588 | 52,750 | Sand and gravel. |
| Lyman | 27,187 | | |
| Marshall | 6,565 | 20,000 | Sand and gravel. |
| McCook | 21,880 | | |
| McPherson | 1,189 | (2) | Sand and gravel. |
| Meade | 44,055 | 446,942 | Sand and gravel, stone. |
| Miner | 3,666 | (2) | Sand and gravel. |
| Minnehaha | (2) | 1,013,400 | Stone, sand and gravel. |
| Moody | 17,422 | 63,150 | Sand and gravel. |
| Pennington | 6,838,936 | 7,910,675 | Cement, stone, sand and gravel, clays, feldspar, gypsum, beryl, mica, gem stones, columbium-tantalum. |
| Perkins | 21,188 | 12,900 | Sand and gravel. |
| Roberts | 41,830 | 65,000 | Do. |
| Spink | 14,007 | 47,000 | Do. |
| Stanley | 39,500 | (2) | Do. |
| Sully | 20,600 | 72,750 | Do. |
| Turner | 39,938 | 73,750 | Do. |
| Union | 24,595 | 24,000 | Do. |
| Walworth | 24,250 | 23,750 | Do. |
| Undistributed [3] | 9,820,131 | 7,418,713 | |
| Total [4] | 40,526,000 | 41,797,000 | |

[1] The following counties are not listed because no production was reported: Bennett, Campbell, Faulk, Jones, Mellette, Potter, Sanborn, Shannon, Todd, Tripp, Washabaugh, Yankton, Ziebach.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[3] Includes value of minerals that cannot be assigned to specific counties and value of minerals for counties indicated in the table by footnote 2.

[4] Total has been adjusted to eliminate duplicating value of raw materials used in manufacturing cement.

Digitized by Google

**Butte.**—Bentonite produced from pits near Belle Fourche was processed by American Colloid Co. Eastern Clay Products Department, International Minerals & Chemical Corp., processed bentonite from deposits in Crook County, Wyo., at its plant at Belle Fourche. Black Hills Clay Products Co. mined miscellaneous clay from the Fuson formation for building brick, tile, and other heavy clay products. The county highway department produced paving gravel. Shell Oil Co. drilled an oil well to a depth of 4,533 feet, at which point it was abandoned. Geophysical (seismograph) work was done by Sun Oil Co. (3 crew-weeks) and Continental Oil Co. (2 crew-weeks). The county ranked fourth in the State in the value of mineral production.

**Codington.**—This county ranked fourth in South Dakota in sand and gravel production. American Sand & Gravel Corp., Hallett Construction Co., and Zeller Concrete Materials Co. produced building sand and gravel. Zeller Concrete Materials Co. and the county highway department produced paving gravel.

**Custer.**—The mineral production of Custer County came almost entirely from numerous pegmatite dikes. The county ranked ninth in South Dakota in mineral-production value. The principal product was feldspar, which was produced by 93 operators, many of whom produced only a few tons. Abingdon Potteries, Inc., operated the White Elephant mine and purchased a small quantity of feldspar, all of which was shipped to its grinding plant at Abingdon, Ill. Consolidated Feldspar Department, International Minerals & Chemical Corp., operated several mines and purchased crude material from individual producers for grinding at its plant at Custer and at Denver, Colo. A fire on May 1 damaged the top 3 floors of the Custer plant, with an estimated loss of $20,000. Damages were not extensive enough to completely shut down the plant; and after emergency repairs and a revision of the flowsheet, the plant continued operations on a curtailed basis. The principal independent producers included William Gould, James Mayberry, John Phelps, R & N Mining Co., and Kenneth Spring.

Beryllium concentrate (beryl) was recovered from pegmatites. Production was reported by 79 companies, individuals, and combinations of individuals; all of it was sold to the Government through the GSA Custer (S. Dak.) Purchase Depot (57 percent) for stockpiling and to Gladys Wells McKinley (43 percent) for resale to consumers. Major producers were George C. Bland at the Bull Moose Lode, Beecher No. 3 Lode, Someday, Wells, and Pleasant Valley Lode mines; Consolidated Feldspar Department, International Minerals & Chemical Corp. at the Tin Mountain; Walter Hough & J. W. Judson at the High Climb Lode and Wood; Harold & Jim Kouba at the Tin Mountain; and John Roseberry at the Elk Horn. Columbite-tantalite concentrates were recovered by Mineral Mills, Inc., J. D. Long, and Squire Gamber. The entire production was sold through GSA at Custer.

Mica was produced by 43 operators: 1 produced only sheet mica, 1 produced sheet and hand-cobbed mica, 5 produced sheet, hand-cobbed, and scrap mica, 25 produced hand-cobbed mica, 6 produced hand-cobbed and scrap mica, and 5 produced only scrap mica. Sheet and hand-cobbed mica was sold to the Government GSA Custer (S. Dak.) Purchase Depot for processing. Scrap mica was sold to

Digitized by Google

grinders and to Gladys Wells McKinley for resale to grinders. Among the major producers of mica in Custer County were Roseberry & Martin which produced hand-cobbed mica at the Redbird mine; Lewis W. Collingwood, hand-cobbed mica at the Silver Dollar and Ann mines; Dale McDermond, hand-cobbed and scrap mica at the White Bear and Redbird mines; George R. Campbell, Sr., hand-cobbed and scrap mica at the New York mine; Dale D. Brown, sheet, hand-cobbed, and scrap mica at the Dilly Ridge mine; Walter W. Andre, hand-cobbed mica at the McArthur mine; and Eugene V. Schefeik, hand-cobbed and scrap mica at the Diamond Dick Lode.

Quicklime was produced by the Black Hills Lime Co. at Pringle for metallurgical purposes. Limestone for the plant was mined from a nearby quarry. Rose quartz, jasper, agate, and agatized wood were collected for sale to polishers and as specimens. F. R. Schultz Construction Co. produced paving gravel for the Federal Forest Service.

T. C. Eyres completed an oil well in the vicinity of the discovery by L. A. Helms in 1955. The well was abandoned at 1,378 feet in the First Leo sandstone. Pure Oil Co. completed 2 crew-weeks of seismograph work.

Black Hills Uranium Co. and Edgemont Mining & Uranium Corp. produced uranium ore at the Freezeout No. 2 mine, which was shipped to the Mines Development Inc. mill at Edgemont.

**Dewey.**—Dewey County Coal Co. produced coal (lignite) from a strip pit at Firesteel. This was the only coal mine in the State producing more than 1,000 tons.

Herndon Drilling Co. completed a wildcat well at 4,890 feet, at which point it was abandoned.

**Fall River.**—Construction of the Mines Development, Inc., 300-ton-a-day, uranium-processing mill at Edgemont was completed and began operating early in July. Operation of the AEC buying station was taken over by the corporation from Lucius Pitkin, Inc., on July 1. Completion of the mill stabilized mining operations to a considerable extent, and reported receipts of uranium ore at the mill exceeded 10,000 tons a month. A small quantity of uraniferous lignite was received from deposits in North and South Dakota for test purposes. The mill, the 11th in the United States and the 1st outside the Colorado Plateau area, used a sulfuric-acid leach and the resin-in-pulp ion-exchange process to recover the uranium. Outstanding features of the mill included an automatic control of the pH of the acid leach by recorder-controllers at any desired acidity, and control of solution flow by a distribution system that completely eliminated valves in the pipelines. A signal panel indicated the flow of solutions and provided a visual flowsheet at all times.

Exploration, consisting of drilling, sinking, raising, drifting, and stripping, continued. Rotary drilling was used extensively, and 1,951 drill holes totaling 122,748 feet were completed. Wagon drilling totaled 2,000 feet; 481 feet of shafts, raises, and winzes was completed; 3,080 feet of adits, drifts, and crosscuts was driven; and about 5,000 cubic yards of stripping was done. From July 1, 1955, to June 30, 1956, 21,728 tons of ore was delivered to the Edgemont buying station from deposits in Fall River County.

Shippers to the buying station during the fiscal year included Black Hills Uranium Co., from the Clara Belle group, Holdup group, Hot-

Digitized by Google

Point No. 7, Kados No. 3, Yellow Cat No. 1, and Shamrock No. 4; Mining Research Corp., from the Gull Lease; Edgemont Mining Uranium Corp., from the Taylor No. 2, Trail Fraction, Freezeout, and Gould Lease; F. J. & F. Albright, from the Green Acres group; South Dakota Uranium & Mining Co., from the Too Late No. 2; Big Sioux Uranium & Minerals Co., from the Too Late No. 2 and Canyon; Lorenz Bros., from the Damsite group and Accidental No. 1; Roy E. Chord, from the Coal Canyon and Helen; Pictograph Mining Co., from the Pictograph and Marty Lease; McLeod Development, from the K–7; and Diamond Mining Co., from the King. A DMEA contract for exploration of the Teepee prospect by the Uranium Research & Development Co. was approved. The exploration, consisting of drilling, was done in October and November.

Eight exploratory oil wells were completed by Herndon Drilling Co. (1) and Pure Oil Co. (7). No data were released, and the wells were abandoned. Geophysical (seismograph) work was done by Ohio Oil Co. (9 crew-weeks), Pure Oil Co. (1 crew-week), and Shell Oil Co. (1 crew-week).

Batie Gravel Co. produced building sand and gravel, Oral Sand Co., building and paving sand and gravel, and Fall River Sand & Gravel Co. paving gravel.

**Grant.**—Production of dimension granite from Grant County quarries in 1956 decreased 6 percent in quantity and 4 percent in value compared with 1955. The county ranked third in South Dakota in the value of mineral production. Seven companies operated eight quarries, all near Big Stone City and Milbank. Rough stone produced by four companies was finished at plants in Minnesota.

Consolidated Quarries, Inc., operated a quarry at Milbank; the rough stone was finished at the plant at Sauk Rapids, Minn. Dakota Granite Co. operated the Dakota No. 1 and American Rose quarries at Milbank. The rough stone was finished for use in monuments and mausoleums and marketed as Dakota Mahogany, American Rose, and American Bouquet. Delano Granite Works, Inc., produced rough stone at its Milbank quarry and finished the stone at Delano, Minn., for use in buildings and monuments. Melrose Granite Co. operated the Melrose Russet quarry and finished the stone at its plant in St. Cloud, Minn., for use in monuments. North Star Granite Corp. produced rough stone at its Quarry No. 7 at Big Stone City. The rough stone (Dakota Mahogany) was finished at its plant at St. Cloud, Minn. Robert Hunter Granite Co., Inc., produced rough and finished stone for use in buildings and monuments at its quarry and plant at Milbank. The stone was marketed as Royal Purple. Steiner-Rausch Granite Co., Inc., operated its quarry and plant at Big Stone City. Rough, and dressed stone (Columbia or Carnelian Mahogany) was marketed for use in buildings and monuments.

Walter Lindberg produced paving sand; Torgrude Construction Co. and the county highway department produced paving gravel.

**Hanson.**—Spencer Quarries, Inc., produced crushed sandstone for riprap, concrete aggregate, and road material. Production in 1956 increased 34 percent in quantity and 39 percent in value compared with 1955. The county ranked sixth in the State in the value of mineral output.

Digitized by Google

**Harding.**—Harding County continued to be the only producer of crude oil in South Dakota. Production came from 2 wells in the Buffalo field and at about the same rate as in 1955. Sun Oil Co. drilled a deep-test well 8 miles northeast of the Buffalo field. Some free oil was recovered on a drill-stem test at 9,200–9,260 feet in the Red River formation, of Ordovician age; the well was abandoned at 9,365 feet. Ohio Oil Co. drilled a deep-test well in the northwestern corner of the county; it was abandoned at 8,894 feet in granite. Amerada Petroleum Corp. drilled a well in the southwestern corner of the county; the well, tested at 3,450 feet in the Newcastle formation of Cretaceous age, had no indications of oil and was abandoned. Geophysical (seismograph) work was done by Continental Oil Co. (10 crew-weeks), Mobil Producing Co. (18 crew-weeks), The Texas Co. (16 crew-weeks), and Sun Oil Co. (1 crew-week).

Exploration of uraniferous-lignite deposits continued, with 200 feet of rotary drilling and 3,500 cubic yards of stripping. Several hundred tons of uranium-bearing lignite was shipped to the Mines Development, Inc., mill at Edgemont for testing.

**Lake.**—Madison Sand & Gravel Co. produced building sand and gravel and paving gravel. Roger Jones produced paving gravel for the State highway commission. The county highway department produced paving gravel and awarded contracts for paving gravel to Walt Brownlee, J. F. Brunken & Son, Gustafson & Reynolds, and Roger Jones.

**Lawrence.**—Lawrence County led the State in the value of mineral output and continued to be the leading gold-producing district in the United States. Mineral production in 1956 was valued at $20.3 million—an 8-percent increase compared with 1955. The value of gold production increased 7 percent, iron ore tenfold, sand and gravel sixfold, and stone nearly threefold. The value of silver produced decreased 12 percent

The Homestake Mining Co., the leading gold producer in the United States, operated its mine and mill at Lead the entire year. The tons of ore milled increased 5 percent, and bullion sales increased 7 percent over 1955. Both mining and milling costs increased, the average being 6.7 cents a ton. Developed ore reserves declined 1.5 million tons, and the average value declined 5 cents a ton. The deep-level development continued, and crosscutting started from the No. 4 winze (sunk from the 5,000 level) on the 5,300 and 5,600 levels. The winze was bottomed on the 5,700 level. Development of the long-range ventilation program continued as planned.

A fourth ball-mill unit began operation in February and increased the annual tons of ore milled by 77,000. A wage raise of 7.5 cents an hour was granted and became effective January 1, 1956. An additional raise of 6 cents an hour was authorized, to become effective on January 1, 1957.

The Bald Mountain Mining Co. operated the Clinton, Portland, Dakota, Decorah, and Gold Bug mines and the 350-ton-a-day, all-sluice cyanide plant at Trojan. The tons of ore milled in 1956 increased less than 1 percent, but the value of bullion sales increased 6 percent compared with 1955. A higher gold content and lower silver content in the ore milled accounted for the increase in value.

Digitized by Google

TABLE 10.—Ore milled, receipts, and dividends, Homestake mine, 1952–56 [1]

| Year | Ore milled (short tons) | Receipts for bullion product | | Dividends |
|---|---|---|---|---|
| | | Total | Per ton | |
| 1952 | 1,209,884 | $16,379,986 | $13.5385 | $3,717,168 |
| 1953 | 1,368,059 | 18,251,984 | 13.3415 | 4,018,560 |
| 1954 | 1,485,226 | 18,409,610 | 12.3951 | 4,018,560 |
| 1955 | 1,550,116 | 18,055,258 | 11.6477 | 4,018,560 |
| 1956 | 1,627,719 | 19,354,312 | 11.8905 | 4,018,560 |

[1] From 1876 to 1956, inclusive, this mine yielded bullion and concentrates that brought a net return of $619,315,031 and paid $194,813,674 in dividends.

Pete Lien & Sons produced iron ore at the Strawberry Hill Mining Co. mine for use in cement. Previous iron production had been from deposits near Nemo.

Cole Construction Co. produced paving sand and gravel and crushed limestone for riprap, concrete aggregate, and road material, and in sugar refining. Cole & McLaughlin produced paving gravel for the city of Lead and crushed limestone for concrete aggregate and road material. Floyd Stapp Construction Co. produced crushed miscellaneous stone for road construction. The county highway department produced crushed limestone for riprap.

**Meade.**—Hills Materials Co. produced building and paving gravel. A. W. Kost and Robert Strong produced paving gravel and crushed miscellaneous stone for concrete aggregate and road material for the county highway department. Henry, Hanson & Conlon Exploration Co. bored 9 rotary-drill holes for a total of 360 feet on the Lamberton property to explore for uranium ore. Thirteen wildcat oil wells were drilled—Continental Oil Co. (6), Phillips Petroleum Co. (4), and Herndon Drilling Co. (3)—for a total of 35,333 feet. All were dry holes and were abandoned. Geophysical (seismograph) work was done by the Sun Oil Co. (13 crew-weeks) and Kerr-McGee (1 crew-week).

**Minnehaha.**—Concrete Materials Co. produced crushed sandstone for riprap, concrete aggregate, road material, filter medium, and refractories. The company also produced building and paving sand and paving gravel. L. G. Everist, Inc., produced crushed sandstone for riprap, concrete aggregate, road material, railroad ballast, refractories, the manufacture of ferrosilicon, and for use in filters and foundries. Eagle Sand & Gravel Co. produced building sand and paving gravel. Frank E. Lacey produced paving gravel. Minnehaha County ranked fifth in the State in the value of mineral production.

**Miner.**—Weelborg Bros. produced paving gravel for the county highway department.

**Pennington.**—The value of mineral production from the mines and quarries in Pennington County in 1956 was $7.9 million, a gain of $1.1 million (16 percent) over 1955. Increases in value were recorded in cement, clays, feldspar, gypsum, mica, sand and gravel, and stone. The value of beryl and columbite-tantalite concentrates decreased. As in previous years, the county ranked second in the State in the value of its mineral output.

465877—58——66

Digitized by Google

The South Dakota Cement Commission operated the South Dakota Cement Plant owned by the State at Rapid City. Shipments of portland cements (types I, II, III, and V) and masonry cements in 1956 increased 11 percent in quantity and 17 percent in value compared with 1955. The average price of portland cement was increased from $2.84 a barrel in 1955 to $2.98 in 1956. Masonry cement advanced from $3.56 a barrel in 1955 to $3.73 in 1956. The commission produces the limestone, shale, sand, and gypsum used at the plant from deposits near Rapid City. Iron ore from deposits in Lawrence County, used in the mix, was purchased from the producer. An additional kiln and grinding unit were installed at the plant, which increased the capacity 44 percent. Shipments in 1956 were mainly to consumers in South Dakota (72 percent), North Dakota (10 percent), and Nebraska (6 percent), with smaller amounts to Wyoming, Montana, Minnesota, Iowa, Colorado, Illinois, and Canada.

Beryllium concentrate (beryl), produced by 29 companies, individuals, and combinations of individuals accounted for 52 percent of the beryl output of South Dakota. It was sold to the Government (GSA) Custer (S. Dak.) Purchase Depot (55 percent) for stockpiling and to Gladys Wells McKinley (45 percent) at Custer for resale to consumers. Major producers were Dale McDermond at the Whitecap Lode; Consolidated Feldspar Department, International Minerals & Chemical Corp., at the Hugo; John Nickels, Jr., at the Star Lode; Keystone Feldspar & Chemical Co., at the Peerless; Black Hills Keystone Corp., at the Bob Ingersoll; and Harold Hall, at the Whitecap, Peerless, and Big Chief. Ira L. Babbington, the only producer of columbite-tantalite concentrate in the county, furnished 25 percent of the State output in 1956. Feldspar—the principal pegmatite mineral—was produced by 34 operators—19 of them produced only a few tons. Major operators were Consolidated Feldspar Department, International Minerals & Chemical Corp., Hough & Patterson, Keystone Feldspar & Chemical Co., and Jack Pendleton. All of the output was ground at Keystone and at Denver, Colo., by Consolidated Feldspar Department, International Minerals & Chemical Corp. The ground product was used in glass, pottery, enamel, soaps, and abrasives. Gem stones, chalcedony, jasper, agate, and agatized and petrified wood were collected by five operators in the Bad Lands in the eastern part of Pennington County.

Hand-cobbed and scrap mica was produced by 23 operators. The value of output in 1956 increased 21 and 31 percent, respectively, compared with 1955. Eight operators produced hand-cobbed mica, 13 produced scrap mica, and 2 produced both hand-cobbed and scrap mica. Hand-cobbed mica was sold to the Government (GSA) Custer (S. Dak.) Purchase Depot for processing and stockpiling of the strategic mica recovered. Scrap mica was sold to grinders and to Gladys Wells McKinley at Custer for resale to consumers. Major producers of hand-cobbed mica included Dale McDermond at the Whitecap, Clemadair Pepin at the Robertson, and Uranium & Allied Minerals, Inc. Principal producers of scrap mica were Black Hills Keystone Corp. at the Bob Ingersoll; Consolidated Feldspar Department, International Minerals & Chemical Corp., at the Hugo; Keystone Feldspar & Chemical Co., at the Peerless; and John Nickels, Jr., at the Star Lode.

Digitized by Google

Light Aggregates, Inc., mines shale from the Pierre formation near Rapid City for lighweight aggregate. The bloated product was used principally as aggregate in concrete blocks.

Base Central Mix Co. produced building sand and gravel. Birdsall Sand & Gravel Co. produced building and paving sand and gravel, and gravel for railroad ballast. Richard H. Christle, Peter Kiewit Sons' Co., and Pete Lien & Sons produced building gravel. F. R. Schultz Construction Co. produced paving gravel for the United States Forest Service. Pennington County Highway Department produced paving sand and awarded a contract to Floyd Stapp Construction Co. for paving gravel. L. G. Everist, Inc., Hills Materials Co., and Pete Lien & Sons produced crushed limestone for concrete aggregate and road material. Pete Lien & Sons produced riprap.

Reserve Drilling Co. drilled a wildcat well to a depth of 5,575 feet, where it was abandoned.

**Stanley.**—W. H. Noel Co. produced paving gravel for the State highway commission.

Digitized by Google

Digitized by Google

# The Mineral Industry of Tennessee

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Tennessee Division of Geology.

By Avery H. Reed, Jr.[1] and William D. Hardeman, Jr.[2]

RECORD production of copper, zinc, cement, clays, mica, phosphate rock, pyrite, sand and gravel, stone, and bituminous coal highlighted the mineral industry of the State in 1956. Among the the States, Tennessee led in pyrite production and ranked second in producing phosphate rock.

The total value of mineral production reached a new high and represented a 15-percent gain over 1955 and a 30-percent increase over 1954.

The leading industries were coal mining, cement manufacture, stone quarrying, zinc and copper production, and phosphate-rock

**TABLE 1.—Mineral production in Tennessee, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Cement: | | | | |
| Masonry ..... 376-pound barrels | 794, 994 | $2, 497, 287 | 705, 141 | $2, 420, 648 |
| Portland ..... do | 8, 016, 859 | 21, 175, 825 | 8, 049, 701 | 23, 013, 979 |
| Clays | 1, 207, 613 | 4, 169, 885 | 1, 378, 512 | 4, 887, 609 |
| Coal | 7, 052, 844 | 28, 746, 574 | 8, 847, 770 | 35, 608, 736 |
| Copper (recoverable content of ores, etc.) | 9, 911 | 7, 393, 569 | 10, 449 | 8, 881, 650 |
| Gold (recoverable content of ores, etc.) ..... troy ounces | 221 | 7, 735 | 189 | 6, 615 |
| Lead (recoverable content of ores, etc.) | | | 5 | 1, 570 |
| Lime | 103, 257 | 1, 102, 005 | 124, 592 | 1, 436, 200 |
| Manganese ore (35 percent or more Mn) ..... gross weight | 15, 895 | 1, 280, 102 | 17, 821 | 1, 417, 096 |
| Natural gas ..... million cubic feet | 39 | 5, 000 | 45 | 6, 000 |
| Phosphate rock ..... long tons | 1, 465, 902 | 10, 526, 404 | 1, 685, 003 | 11, 643, 123 |
| Sand and gravel | 5, 136, 543 | 5, 814, 116 | 5, 629, 341 | 6, 480, 573 |
| Silver (recoverable content of ores, etc.) ..... troy ounces | 66, 619 | 60, 294 | 64, 878 | 58, 718 |
| Stone | [2] 14, 381, 431 | [3] 22, 276, 037 | [2] 15, 556, 194 | [3] 23, 796, 346 |
| Zinc (recoverable content of ores, etc.) | 40, 216 | 9, 893, 136 | 46, 023 | 12, 610, 302 |
| Value of items that cannot be disclosed: Barite, fluorspar (1956), iron ore, mica (1956), petroleum, pyrite, and stone (granite, 1955, and crushed sandstone) | | 6, 994, 403 | | 8, 771, 424 |
| Total Tennessee [3] | | 119, 316, 000 | | 137, 846, 000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Incomplete figure; excludes granite (1955) and crushed sandstone.
[3] Total adjusted to eliminate duplicating value of clays and stone.

[1] Chief, Field Office, Division of Mineral Industries, Region V, Knoxville, Tenn.
[2] State geologist, Division of Geology, Department of Conservation, Nashville, Tenn.



Digitized by Google

mining and processing. Pig iron and coke were produced at Rockwood, Chattanooga, and Nashville. The following were leading companies: Tennessee Copper Co. produced gold, silver, copper, lead, zinc, and pyrite; Penn-Dixie Cement Corp. operated 2 cement plants, 2 limestone quarries, and 1 clay mine; American Zinc Co. of Tennessee produced zinc and limestone; and Marquette Cement Mfg. Co. operated 2 cement plants, 2 limestone quarries, 1 clay mine, and 1 sand and gravel mine.

**TABLE 2.—Average unit value of mineral commodities produced in Tennessee, 1947–51 (average) and 1952–56 [1]**

| Commodity | 1947-51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Barite (crude)—short ton | (2) | $12.95 | $14.55 | $16.31 | $16.20 | $13.53 |
| Cement: Portland—376-pound barrel | $2.12 | 2.40 | 2.51 | 2.61 | 2.64 | 2.86 |
| Masonry—do | (2) | (2) | (2) | (3) | 3.14 | 3.43 |
| Clays: | | | | | | |
| Ball—short ton | 11.13 | 12.98 | 12.52 | 12.84 | 13.13 | 13.63 |
| Fire—do | 6.96 | 9.57 | 11.36 | 11.36 | 11.36 | |
| Fuller's earth—do | 13.95 | 13.81 | 13.82 | 16.33 | 14.00 | 13.72 |
| Miscellaneous—do | .80 | 1.00 | .96 | .85 | .34 | .32 |
| Coal—do | 5.23 | 4.85 | 4.60 | 3.96 | 4.08 | 4.02 |
| Copper—pound | .22 | .24 | .29 | .30 | .37 | .42 |
| Granite, crushed—short ton | | | 1.20 | 1.25 | 1.00 | 1.25 |
| Iron ore—long ton | 3.97 | 5.91 | 6.47 | 5.77 | 5.78 | 5.80 |
| Lead—pound | .15 | .16 | .13 | | | .16 |
| Lime—short ton | 9.32 | 10.03 | 10.29 | 12.04 | 10.67 | 11.53 |
| Limestone: | | | | | | |
| Crushed—do | 1.25 | 1.25 | 1.24 | 1.23 | 1.18 | 1.22 |
| Dimension—do | .92 | 1.84 | .79 | .94 | .82 | .82 |
| Manganese ore—do | (2) | (2) | 76.91 | 77.81 | 80.53 | 79.52 |
| Marble: | | | | | | |
| Crushed—do | 5.12 | 7.50 | 5.57 | 10.15 | 12.76 | 13.46 |
| Dimension—do | 87.57 | 90.13 | 110.51 | 110.36 | 105.99 | 72.23 |
| Natural gas—thousand cubic feet | .11 | .10 | .12 | .11 | .13 | .13 |
| Phosphate rock (sold or used)—long ton | 6.65 | 7.49 | 7.55 | 7.06 | 7.40 | 7.99 |
| Sand—short ton | 1.30 | 1.25 | 1.26 | 1.35 | 1.30 | 1.33 |
| Gravel—do | .87 | .81 | .89 | 1.07 | 1.01 | 1.01 |
| Sandstone: | | | | | | |
| Crushed—do | 1.67 | | 5.84 | 14.36 | 3.68 | 3.48 |
| Dimension—do | 19.90 | 18.10 | 21.82 | 24.38 | 21.90 | 21.90 |
| Stone, miscellaneous, crushed—do | | 1.50 | | | | |
| Zinc—pound | .14 | .17 | .11 | .11 | .123 | .137 |

[1] For greater detail on prices by grades and markets, see volume I, Minerals Yearbook, 1955.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Not canvassed separately.

## EMPLOYMENT AND INJURIES

Reports submitted to the Bureau of Mines indicate that employment in the mineral industries decreased 15 percent below 1955. Employment declined 39 percent at coal mines, increased 15 percent at quarries and mills, increased 16 percent at metal mines, increased 14 percent at nonmetal mines, and decreased 1 percent at sand and gravel mines.

Injury experience was considerably better than in 1955; the frequency rate decreased 27 percent below 1955. The frequency rate increased 80 percent at nonmetal mines, increased 16 percent at metal mines, decreased 42 percent at quarries and mills, and increased 2 percent at coal mines. Fourteen fatal injuries occurred, compared with 9 in 1955.

Digitized by Google

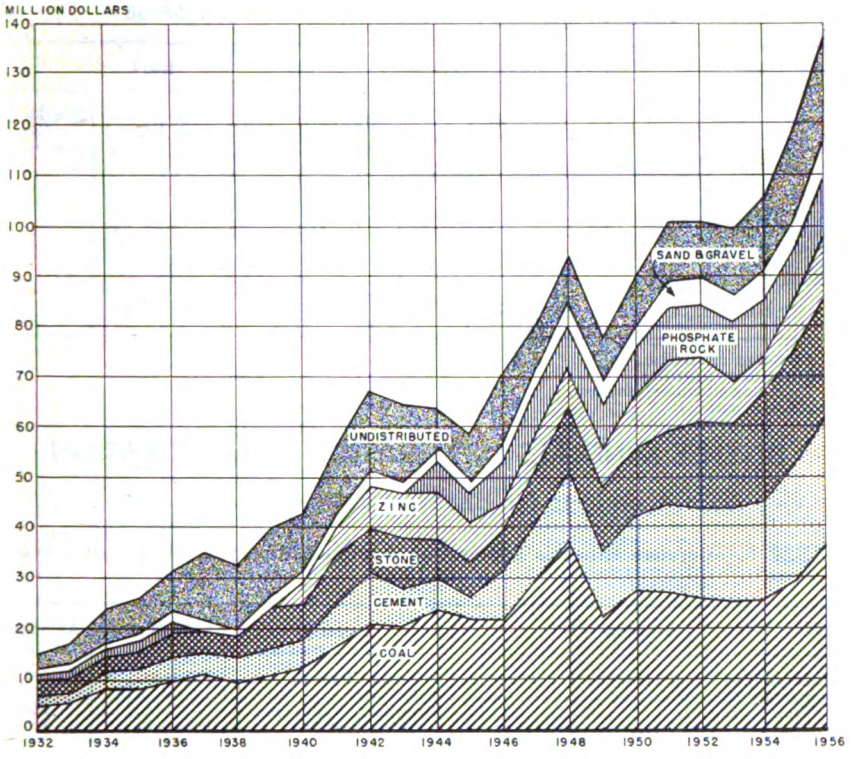



FIGURE 1.—Value of mineral production in Tennessee, 1932–56.

**TABLE 3.—Employment in the mineral industries, 1955–56** [1]

| Industry | 1955 | | | 1956 [2] | | |
|---|---|---|---|---|---|---|
| | Men working daily | Average active days | Man-days worked | Men working daily | Average active days | Man-days worked |
| Coke ovens and smelters | [3] 141 | [3] 349 | [3] 49,243 | 8,180 | 366 | 2,992,983 |
| Coal mines | 6,526 | 158 | 1,034,121 | 3,996 | 184 | 737,046 |
| Quarries and mills | 3,010 | 257 | 773,949 | 3,464 | 255 | 883,638 |
| Metal mines | 1,398 | 223 | 311,562 | 1,616 | 244 | 393,626 |
| Nonmetal mines | 695 | 214 | 148,383 | 795 | 233 | 185,399 |
| Sand and gravel mines [4] | 654 | 256 | 167,488 | 650 | 240 | 155,778 |
| Total | [3] 12,424 | [3] 200 | [3] 2,484,746 | 18,701 | 286 | 5,348,470 |

[1] Excluding oil and gas.
[2] Preliminary figures.
[3] Excluding aluminum smelters.
[4] Excluding Government-and-contractor operations.

Digitized by Google

TABLE 4.—Injuries in the mineral industries, 1955–56 [1]

| Industry | 1955 | | | | 1956 [2] | | | |
|---|---|---|---|---|---|---|---|---|
| | Fatal | Non-fatal | Total | Injuries per million man-days | Fatal | Non-fatal | Total | Injuries per million man-days |
| Coke ovens and smelters | (3) | [3] 5 | [3] 5 | [3] 102 | | 99 | 99 | 33 |
| Metal mines | | 39 | 39 | 125 | 1 | 56 | 57 | 145 |
| Nonmetal mines | | 12 | 12 | 81 | | 27 | 27 | 146 |
| Quarries and mills | 1 | 244 | 245 | 316 | 1 | 162 | 163 | 184 |
| Coal mines | 8 | 213 | 221 | 294 | 12 | 210 | 222 | 301 |
| Sand and gravel mines [4] | | | | | | | | |
| Total | [3] 9 | [3] 513 | [3] 527 | [3] 273 | 14 | 554 | 568 | 106 |

[1] Excluding oil and gas.
[2] Preliminary figures.
[3] Excluding aluminum smelters.
[4] Not canvassed.

## DEFENSE MINERALS EXPLORATION ADMINISTRATION

Nine DMEA projects for zinc were active during the year.

TABLE 5.—Defense Minerals Exploration Administration projects for zinc, active in 1956

| Contractor | Property | County | Amount [1] |
|---|---|---|---|
| American Zinc Co. of Tennessee | Jefferson City area | Jefferson | [2] $1,017,000 |
| New Jersey Zinc Co | Talbot area | do | 156,250 |
| Do | Strawberry Plains area | do | 228,350 |
| Do | Independence area | Hancock | 107,150 |
| Do | Edison area | Hawkins | 107,150 |
| American Zinc Co. of Tennessee | Strawberry Plains area | Knox | 768,170 |
| New Jersey Zinc Co | Big War Creek area | Hancock | 107,150 |
| National Lead Co | Indian Creek area | Grainger | 40,530 |
| Do | Thorn Hill area | do | 57,490 |

[1] Government participation, 50 percent.
[2] Completed.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Copper.**—Tennessee Copper Co., the only copper producer in the State, recovered copper concentrate from sulfide ore mined in Polk County; production increased 5 percent over 1955 to a new annual record.

**Gold.**—Tennessee Copper Co. recovered gold as a byproduct from smelting copper and zinc concentrates. Production decreased 14 percent below 1955.

**Iron Ore.**—Monroe Mining Co. mined brown iron ore in Monroe County; the ore was concentrated by log washing and sold to iron and steel plants at Rockwood. Rockwood Mining Co. mined red iron ore in Roane County for sale to iron and steel plants. The total production of iron ore decreased 13 percent below 1955.

Digitized by Google

**Manganese Ore.**—Metallurgical-grade (plus-35-percent Mn) manganese ore was mined by 9 producers in Carter, Johnson, and Unicoi Counties. Leading producers were Haile Mines, Inc., mines in Unicoi County and the Colitz Mining Co. operations in Johnson County. Shipments increased 12 percent over 1955. All ore was shipped to GSA stockpiles.

**TABLE 6.—Production of manganese ore, 1947–51 (average) and 1952–56 (35-percent or more Mn)**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 77 | (1) | 1954 | 11,823 | $919,949 |
| 1952 | 126 | (1) | 1955 | 15,895 | 1,280,102 |
| 1953 | 2,625 | $201,898 | 1956 | 17,821 | 1,417,096 |

[1] Figure withheld to avoid disclosing individual company confidential data.

**Silver.**—Tennessee Copper Co. recovered silver as a byproduct from smelting copper and zinc concentrates produced in Polk County. Production decreased 3 percent below 1955.

**Zinc.**—American Zinc Co. of Tennessee, S. W. Forney, New Jersey Zinc Co., and Tennessee Coal & Iron Division of United States Steel Corp. recovered zinc from zinc ore mined in Jefferson and Knox Counties; Tennessee Copper Co. recovered zinc from copper-zinc ore mined in Polk County. New Jersey Zinc Co. was developing a new zinc mine in Hancock County. Production increased 14 percent over 1955 to a new annual record.

**TABLE 7.—Mine production of recoverable gold, silver, copper, lead, and zinc 1947–51 (average) and 1952–56**

| Year | Gold | | Silver | | Copper | |
|---|---|---|---|---|---|---|
| | Fine ounces | Value | Fine ounces | Value | Short tons | Value |
| 1947–51 (average) | 180 | $6,286 | 45,118 | $40,833 | 6,785 | $2,919,868 |
| 1952 | 241 | 8,435 | 57,569 | 52,103 | 7,620 | 3,688,080 |
| 1953 | 293 | 10,255 | 68,935 | 62,390 | 7,829 | 4,493,846 |
| 1954 | 218 | 7,630 | 60,759 | 54,990 | 9,087 | 5,361,861 |
| 1955 | 221 | 7,735 | 66,619 | 60,294 | 9,911 | 7,393,569 |
| 1956 | 189 | 6,615 | 64,878 | 58,718 | 10,449 | 8,881,650 |
| 1850–1956 (total) | 23,000 | (1) | 3,582,700 | (1) | 464,400 | (1) |

| Year | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 81 | $24,580 | 32,898 | $9,378,258 | $12,369,825 |
| 1952 | 18 | 5,796 | 38,020 | 12,622,640 | 16,377,054 |
| 1953 | 9 | 2,358 | 38,465 | 8,846,950 | 13,415,799 |
| 1954 | | | 30,326 | 6,550,345 | 11,974,826 |
| 1955 | | | 40,216 | 9,893,136 | 17,354,685 |
| 1956 | 5 | 1,570 | 46,023 | 12,610,302 | 21,558,855 |
| 1850–1956 (total) | 16,000 | (1) | 1,208,000 | (1) | 398,378,000 |

[1] Included with "Total value."

Digitized by Google

## NONMETALS

**Barite.**—In Monroe County, B. C. Wood and National Lead Co. mined barite, which was crushed or ground for well-drilling, glass, rubber, paint, and other uses.

**Cement.**—Portland cement was produced by 4 companies at plants in 6 counties. The leading producer was the Penn-Dixie Cement Corp. with plants in Marion and Sullivan Counties. Shipments increased slightly over 1955 to a new annual record. Masonry cement was produced by 4 companies in 5 counties; the leading producer was the Marquette Cement Mfg. Co. with plants in Davidson and Franklin Counties; total shipments were 705,000 376-pound barrels valued at $2,421,000.

**TABLE 8.—Finished portland cement produced, shipped and in stock, 1947–51 (average) and 1952–56, in 376-pound barrels**

| Year | Production, barrels | Shipment from mills | | Stocks at mills on Dec. 31 |
|---|---|---|---|---|
| | | Barrels | Value | |
| 1947–51 (average) | 6,522,388 | 6,538,975 | $13,885,490 | 292,531 |
| 1952 | 7,439,873 | 7,428,604 | 17,834,060 | 388,200 |
| 1953 | 7,474,604 | 7,276,964 | 18,283,366 | 585,330 |
| 1954 | 7,523,507 | 7,569,279 | 19,734,262 | 540,156 |
| 1955 | 8,109,659 | 8,016,859 | 21,175,825 | 361,938 |
| 1956 | 8,386,173 | 8,049,701 | 23,013,979 | 476,314 |

**Clays.**—Ball clay was mined by 6 companies in 3 counties. The leading producer was United Clay Mines Corp., operating in Weakley County. Production increased 14 percent over 1955 to a new annual record, owing mainly to increased demand for whiteware. The clay was used in whiteware, floor and wall tile, firebrick and block, art pottery, kiln furniture, enamel, and other applications.

Two companies mined fuller's earth in Henry County for absorbent uses. Production expanded 42 percent over 1955 to a new annual record.

Seventeen companies mined miscellaneous clay in 11 counties. The leading producer was General Shale Products Corp., operating in

**TABLE 9.—Clays sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Ball clay | | Fire clay | | Fuller's earth | | Miscellaneous clay | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 166,185 | $1,832,958 | 27,939 | $184,478 | (1) | (1) | [1] 829,055 | [1]$875,337 | 1,023,179 | $2,892,773 |
| 1952 | 163,862 | 2,127,274 | 21,290 | 203,845 | 25,974 | $358,752 | 831,113 | 829,272 | 1,042,239 | 3,519,143 |
| 1953 | 165,822 | 2,075,882 | (2) | (2) | 30,961 | 427,933 | (2) | (2) | 1,037,450 | 3,478,622 |
| 1954 | 194,072 | 2,491,229 | 15,437 | 175,364 | 27,532 | 449,480 | 778,215 | 664,879 | 1,015,256 | 3,780,952 |
| 1955 | 254,034 | 3,334,577 | 4,604 | 52,300 | 33,791 | 473,074 | 915,184 | 309,934 | 1,207,613 | 4,169,885 |
| 1956 | 290,092 | 3,892,709 | ------ | ------ | 48,000 | 658,500 | 1,040,420 | 336,400 | 1,378,512 | 4,887,609 |

[1] Fuller's earth included with miscellaneous clay.
[2] Figure withheld to avoid disclosing individual company confidential data.

Digitized by Google

TABLE 10.—Ball clay sold or used by producers, 1955–56, by uses

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Whiteware | 176,805 | $2,270,728 | 197,408 | $2,610,394 |
| Floor and wall tile | 41,893 | 573,940 | 52,576 | 727,639 |
| Firebrick and block | 12,581 | 176,141 | (1) | (1) |
| Art pottery | 8,579 | 125,178 | (1) | (1) |
| Kiln furniture | 8,282 | 118,614 | (1) | (1) |
| Exports | 550 | 5,214 | 800 | 8,000 |
| Enamel | 284 | 4,172 | 65 | 650 |
| Heavy clay products | 2,930 | 29,300 | | |
| Other uses | 2,130 | 31,290 | 39,243 | 546,026 |
| Total | 254,034 | 3,334,577 | 290,092 | 3,892,709 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other uses."

Knox, Sullivan, and Washington Counties. Production increased 14 percent over 1955 to a new annual record. The clay was used for cement, heavy clay products, floor and wall tile, and lightweight aggregates.

**Fluorspar.**—Tennessee Mineral Co., composed of individuals from the Western Kentucky fluorspar district, reopened the old Lebanon mine and shipped Metallurgical-grade fluorspar to Marion, Ky.

**Lime.**—Three companies produced 125,000 tons of quicklime and hydrated lime in Knox County for building, agricultural, chemical, and industrial uses.

**Mica.**—After construction of Davy Crockett Lake by the Tennessee Valley Authority, silt was deposited in the lake at the mouths of the rivers that traversed the North Carolina mica district. This deposit of silt near the shoreline of the lake contained considerable quantities of finely divided mica. In 1956 the International Minerals & Chemical Corp. built a mill near the lake to recover scrap mica suitable for the ground-mica trade.

**Perlite.**—A plant in Nashville employing crude perlite from deposits in Western States produced expanded perlite for use mainly as a lightweight aggregate, replacing heavier materials in plaster and concrete.

**Phosphate Rock.**—Marketable phosphate rock was mined by 22 companies and individuals in 6 counties. Leading producers were the Monsanto Chemical Co. mines in Giles, Maury, and Williamson Counties, and the International Minerals & Chemical Corp. mines in Giles and Maury Counties. Marketable production increased 15 percent over 1955 to a new annual record.

**Pyrite.**—Tennessee led the Nation in producing pyrite. Tennessee Copper Co. recovered pyrite concentrate from sulfide ore mined in Polk County. Production increased 10 percent over 1955 to a new annual record. The concentrate was roasted, and the recovered gases were used in manufacturing sulfuric acid. The iron oxide was sintered for use by iron and steel plants.

Digitized by Google

**TABLE 11.—Marketable production of phosphate rock, 1947–51 (average) and 1952–56**

| Year | Long tons | Value [1] | Year | Long tons | Value [1] |
|---|---|---|---|---|---|
| 1947–51 (average) [2] | 1,457,906 | $9,682,971 | 1954 | 1,633,226 | $11,743,012 |
| 1952 | 1,444,737 | 11,306,438 | 1955 | 1,465,902 | 10,526,404 |
| 1953 | 1,518,912 | 11,305,098 | 1956 | 1,685,003 | 11,643,123 |

[1] Estimated from value of sold or used.
[2] Includes small quantity of apatite from Virginia, 1947.

**TABLE 12.—Phosphate rock sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Long tons | Value [1] | Long tons | Value [1] |
| Elemental phosphorus | [1] 1,220,473 | $9,075,737 | 1,261,784 | $10,987,824 |
| Direct application to the soil | 144,076 | 779,450 | 131,427 | 596,900 |
| Triple superphosphate | [2] 209,628 | [2] 1,132,118 | [2] 163,577 | [2] 712,634 |
| Ordinary superphosphate | [2] | [2] | [2] | [2] |
| Stock and poultry feed | 21,038 | 113,761 | 101,319 | 452,800 |
| Fertilizer filler | | | | |
| Other fertilizers | 99,000 | 535,590 | | |
| Other uses | 5,190 | 42,400 | 4,781 | 41,400 |
| Total | 1,699,395 | 12,579,056 | 1,662,888 | 12,791,558 |

[1] Estimated from company reports.
[2] Ordinary and triple superphosphates are combined.

**Sand and Gravel.**—Forty-two companies mined sand and gravel at 45 mines in 23 counties. Leading producers at the following places were Cumberland River Sand & Gravel Co., Davidson County; Memphis Stone-Gravel Co., Shelby County; Sangravl Co., Inc., Humphreys County; Dixie Sand & Gravel Corp., Hamilton County; and Marquette Cement Mfg. Co., Shelby Counyt. The plants of these companies were at Nashville, Memphis, and Chattanooga. Total production increased 10 percent over 1955 to a new annual record.

**TABLE 13.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Sand | | Gravel | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | (1) | (1) | (1) | (1) | 4,112,435 | 4,321,116 |
| 1952 | 2,531,528 | $3,156,770 | 2,641,873 | $2,146,551 | 5,173,401 | 5,303,321 |
| 1953 | 2,603,874 | 3,288,086 | 2,627,455 | 2,341,601 | 5,231,329 | 5,629,687 |
| 1954 | 2,191,599 | 2,962,012 | 2,963,586 | 3,179,127 | 5,155,185 | 6,141,139 |
| 1955 | 2,159,480 | 2,816,761 | 2,977,063 | 2,997,355 | 5,136,543 | 5,814,116 |
| 1956 | 2,420,657 | 3,223,982 | 3,208,684 | 3,256,591 | 5,629,341 | 6,480,573 |

[1] Figure withheld to avoid disclosing individual company confidential data.

**Stone.**—Blue Ridge Stone Co. crushed 40,000 tons of granite in Carter County for concrete and roads.

Crushed limestone was produced by 81 operators at 109 quarries in 52 counties. The leading producers were Franklin Limestone Co.,

Digitized by Google

**TABLE 14.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| **Sand:** | | | | |
| Structural | 1,160,689 | $1,465,103 | 1,248,234 | $1,519,524 |
| Paving | 700,475 | 605,993 | 711,086 | 706,547 |
| Molding | 224,855 | 572,474 | [1] | [1] |
| Engine | [2] | [2] | 4,756 | 6,446 |
| Railroad ballast | 722 | 903 | 2,676 | 3,345 |
| Other | [2] | [2] | 453,905 | 988,120 |
| **Gravel:** | | | | |
| Paving | 1,579,634 | 1,605,717 | 1,662,864 | 1,622,615 |
| Structural | 1,013,903 | 1,022,102 | 1,162,248 | 1,250,737 |
| Railroad ballast | [2] | [2] | 123,556 | 123,064 |
| Other | 260,000 | 260,000 | 260,016 | 260,175 |
| Total | 5,136,543 | 5,814,116 | 5,629,341 | 6,480,573 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other sand."
[2] Figure withheld to avoid disclosing indivudial company confidential data; included with "Total."

Davidson, Humphreys, and Williamson Counties; Lambert Bros., Inc., Blount, Davidson, Hawkins, Knox, and Sevier Counties; and Penn-Dixie Cement Corp., Marion and Sullivan Counties. Total production increased 8 percent over 1955 to a new annual record.

Davidson County Highway Department quarried a small quantity of dimension limestone for building stone.

Crushed marble was produced by 3 companies at 7 quarries in Blount and Knox Counties. The leading producer was John J. Craig Co. in Blount County. Total production increased 10 percent over 1955.

Dimension marble was quarried by 6 companies at 13 quarries in 4 counties. The leading producer was Gray Knox Marble Co. in Blount and Knox Counties. Total production expanded 44 percent over 1955 to the highest point in many years.

Ayers Mineral Co. and Turner Bros. Stone Co. produced crushed sandstone in Cumberland and Henderson Counties. Total production increased 2 percent over 1955.

Dimension sandstone was quarried by 9 producers in 5 counties; the leading company was Crab Orchard Stone Co., Inc., in Cumberland County. Total production declined 25 percent below 1955.

**TABLE 15.—Crushed and broken stone sold or used by producers, 1947–51 (average) and 1952–56**

| | Limestone | | Marble | | Sandstone | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) [1] | 7,740,425 | $9,679,567 | 22,635 | $109,989 | [2] | [2] | [3] 7,763,060 | [3] $9,789,556 |
| 1952 [1] | 10,250,723 | 12,790,302 | 15,381 | 115,424 | | | 10,266,104 | 12,905,726 |
| 1953 [1] | 10,373,162 | 12,870,198 | 31,142 | 173,398 | 1,222 | $7,132 | [3] 10,405,904 | [3] 13,050,728 |
| 1954 | 13,878,172 | 17,090,152 | 17,620 | 178,789 | 4,496 | 64,544 | [3] 13,900,288 | [3] 17,333,485 |
| 1955 | 14,253,887 | 16,823,504 | 16,034 | 204,532 | [2] | [2] | [3] 14,269,921 | [3] 17,028,036 |
| 1956 | 15,390,818 | 18,743,973 | 17,663 | 237,823 | [2] | [2] | [3] 15,408,481 | [3] 18,981,796 |

[1] Except limestone for cement or lime.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Incomplete total; excludes sandstone, 1947–49 and 1955–56; and granite, 1953–56.

Digitized by Google

**TABLE 16.—Crushed limestone sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Concrete and roads | 10,265,850 | $12,219,237 | 11,036,216 | $13,296,425 |
| Cement and lime | 2,362,990 | 2,526,031 | 2,627,036 | 3,120,566 |
| Agstone | 671,570 | 919,397 | 815,589 | 1,112,065 |
| Railroad ballast | 588,207 | 579,584 | 461,182 | 441,112 |
| Fluxing stone | 72,249 | 97,238 | 89,770 | 121,736 |
| Asphalt filler | 13,573 | 32,865 | (1) | (1) |
| Glass manufacture | 38,485 | 75,338 | 35,485 | 72,552 |
| Mineral food | 7,000 | 10,500 | 21,000 | 84,000 |
| Paper | (1) | (1) | 10,418 | 15,862 |
| Riprap | 25,858 | 19,108 | 7,595 | 7,813 |
| Rock dust for coal mines | 500 | 2,500 | 3,000 | 14,100 |
| Other uses | 207,605 | 341,706 | 283,527 | 457,742 |
| Total | 14,253,887 | 16,823,504 | 15,390,818 | 18,743,973 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other uses."

**TABLE 17.—Dimension stone sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Limestone | | Marble | | Sandstone | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | (1) | (1) | 32,117 | $2,790,769 | (1) | (1) | (1) | (1) |
| 1952 | 3,226 | $5,926 | 42,940 | 3,870,006 | 46,769 | $846,684 | 92,935 | $4,722,616 |
| 1953 | 2,214 | 1,739 | 24,826 | 2,743,733 | 52,785 | 1,151,853 | 79,825 | 3,897,325 |
| 1954 | 4,292 | 4,015 | 27,611 | 3,047,135 | 65,996 | 1,608,881 | 97,899 | 4,660,031 |
| 1955 | 1,632 | 1,332 | 33,763 | 3,578,493 | 76,165 | 1,668,176 | 111,560 | 5,248,001 |
| 1956 | 1,848 | 1,509 | 48,577 | 3,508,648 | 57,288 | 1,254,393 | 107,713 | 4,764,550 |

[1] Figure withheld to avoid disclosing individual company confidential data.

**TABLE 18.—Dimension marble sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Cubic feet | Value | Cubic feet | Value |
| Building stone: | | | | |
| Interior, cut, dressed | 106,562 | $2,131,252 | 156,174 | $2,250,043 |
| Exterior, rough | 108,169 | 344,846 | (1) | (1) |
| Interior, sawed, dressed | 56,909 | 488,619 | (1) | (1) |
| Interior, rough | 61,112 | 128,961 | (1) | (1) |
| Other uses | 64,461 | 484,815 | 415,318 | 1,258,605 |
| Total | 397,213 | 3,578,493 | 571,492 | 3,508,648 |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other uses."

## MINERAL FUELS

**Coal.**—Coal was produced at 532 active mines in 17 counties; Marion, Anderson, and Campbell Counties were the chief producers. Leading companies were Wind Rock Coal & Coke Co. (Dean mine), Tennessee Products & Chemical Corp. (Reels Cove mine), and Clinchfield Coal Corp. (Meadow Creek mine). Production expanded 25 percent over 1955 to a new annual record for the State, owing mainly to the increased use of coal for power generation.

Digitized by Google

TABLE 19.—Production of coal, 1947–51 (average) and 1952–56

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 5,476,906 | $28,656,884 | 1955 | 7,052,844 | $28,746,574 |
| 1952 | 5,264,954 | 25,559,740 | 1956 | 8,847,770 | 35,608,736 |
| 1953 | 5,466,569 | 25,151,682 | | | |
| 1954 | 6,428,831 | 25,477,006 | Total production (earliest records to date) | 367,845,000 | (1) |

[1] Data not available.

**Natural Gas.**—Marketed production of natural gas was 45,000,000 cubic feet. Production from wells in Morgan and Scott Counties was 36,000 cubic feet, and from the Jamestown field in Fentress County 9,000 cubic feet.

**Petroleum.**—Twenty-one test wells were completed during the year. Total exploratory footage was almost 34,000 feet. Gas from 2 new wells was being used locally, and 1 small oil well was brought in.

TABLE 20.—Production of crude petroleum, 1950–56 [1]

(42-gallon barrels)

| Year | Clay County | Fentress County | Pickett County | Scott and Morgan Counties | Other counties | Total |
|---|---|---|---|---|---|---|
| 1950 | 767 | 1,128 | 504 | 9,682 | 266 | 12,347 |
| 1951 | 66 | 1,628 | 572 | 10,484 | ---------- | 12,750 |
| 1952 | ---------- | 483 | 336 | 10,647 | 3,311 | 14,800 |
| 1953 | ---------- | 3,683 | 1,457 | 10,115 | 1,063 | 16,318 |
| 1954 | ---------- | 3,392 | 1,555 | 7,073 | 780 | 12,800 |
| 1955 | 3,122 | 414 | 804 | 7,895 | 512 | 12,747 |
| 1956 | 1,276 | 484 | 636 | 6,278 | ---------- | 8,675 |

[1] Data from Tennessee Department of Conservation, Division of Geology.

## REVIEW BY COUNTIES

Production was reported from 76 of the State's 95 counties. Leading counties were Polk, Knox, Marion, and Jefferson. In addition to the commodities described in detail in the following county listing, oil and gas were produced; and a small quantity of sand of undetermined county origin, was mined.

**Anderson.**—Thirty companies mined 1,757,000 tons of coal; leading companies were Wind Rock Coal & Coke Co. (Dean mine) and Mahan-Ellison Coal Corp. (Morco colliery). Ralph Rogers & Co., Inc., and Anderson County Highway Department crushed limestone for concrete and roads. Lake City Lightweight Aggregate Co. mined 30,000 tons of miscellaneous clay for lightweight aggregates.

**Bedford.**—Bedford County Highway Department and Shelbyville Limestone Co. crushed limestone for agstone, concrete, and roads.

**Benton.**—Camden Gravel Co., Hardy Sand Co. (Hardy and Silica mines), Hicks Sand Co., Kimballs Mineral Supplies, Inc., Porter-Warner Industries, Inc., and Tri-State Sand Co. mined glass, molding, paving, engine sand, and paving gravel; production was 371,000 tons.

**Bledsoe.**—Ten companies mined 39,000 tons of coal; the leading producer was J. R. Lovell Coal Co. (No. 1 Strip mine).

Digitized by Google

**TABLE 21.—Value of mineral production in Tennessee, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Anderson | (3) | (3) | Coal, limestone, miscellaneous clay. |
| Bedford | $147,017 | (3) | Limestone. |
| Benton | 679,789 | $766,223 | Sand and gravel. |
| Bledsoe | 104,397 | 170,859 | Coal. |
| Blount | (3) | (3) | Marble, limestone. |
| Bradley | (3) | 270,000 | Limestone. |
| Campbell | 5,126,655 | (3) | Coal, limestone, sand and gravel. |
| Cannon | 34,500 | (3) | Limestone. |
| Carroll | (3) | (3) | Ball clay. |
| Carter | 475,607 | 664,978 | Limestone, manganese ore, granite. |
| Claiborne | 1,803,086 | 1,649,973 | Coal. |
| Cocke | 24,325 | 30,472 | Limestone. |
| Coffee | (3) | (3) | Do. |
| Cumberland | 2,223,519 | 1,756,640 | Sandstone, coal, limestone. |
| Davidson | 6,060,067 | 6,123,038 | Cement, limestone, sand and gravel, miscellaneous clay, phosphate rock. |
| Decatur | (3) | (3) | Sand and gravel. |
| De Kalb | 84,057 | 18,190 | Limestone. |
| Dickson | (3) | (3) | Do. |
| Fayette | 176,260 | 18,200 | Sand and gravel. |
| Fentress | 552,006 | 1,481,586 | Coal, limestone,sandstone. |
| Franklin | (3) | (3) | Cement, limestone, sand and gravel, miscellaneous clay. |
| Giles | 1,223,200 | 1,791,884 | Phosphate rock, limestone, sand and gravel. |
| Grainger | 34,395 | 44,553 | Marble, limestone. |
| Greene | 437,167 | 573,910 | Limestone, sand and gravel, mica. |
| Grundy | 1,041,436 | 1,704,187 | Coal, limestone. |
| Hamilton | 6,233,618 | 7,156,249 | Cement, limestone, coal, sand and gravel, miscellaneous clay. |
| Hardeman | 35,750 | (3) | Sand and gravel. |
| Hawkins | 199,166 | 42,141 | Limestone. |
| Haywood | 9,055 | 19,540 | Sand and gravel. |
| Henderson | (3) | (3) | Sandstone. |
| Henry | (3) | (3) | Ball clay, fuller's earth. |
| Hickman | 544,879 | 580,220 | Phosphate rock. |
| Humphreys | (3) | (3) | Limestone, sand and gravel. |
| Jefferson | (3) | (3) | Zinc, limestone. |
| Johnson | 903,805 | 1,067,078 | Manganese ore, limestone. |
| Knox | 14,503,649 | 15,780,700 | Cement, zinc, limestone, marble, lime, sand and gravel, miscellaneous clay. |
| Lauderdale | 6,168 | 17,900 | Sand and gravel. |
| Lincoln | (3) | (3) | Limestone. |
| Loudon | 126,848 | 154,953 | Limestone, sand and gravel, miscellaneous clay. |
| Macon | 65,895 | (3) | Limestone. |
| Marion | (3) | (3) | Coal, cement, limestone. |
| Marshall | (3) | (3) | Limestone. |
| Maury | 6,472,069 | 7,009,405 | Phosphate rock, limestone. |
| McMinn | 220,000 | (3) | Limestone. |
| McNairy | 28,055 | 57,840 | Sand and gravel. |
| Meigs | 157,500 | (3) | Limestone. |
| Monroe | 511,324 | (3) | Barite, limestone, iron ore. |
| Montgomery | (3) | (3) | Limestone. |
| Morgan | 1,662,517 | 1,904,092 | Coal, sandstone. |
| Obion | 40,730 | 46,866 | Sand and gravel. |
| Overton | 220,211 | (3) | Coal, limestone. |
| Perry | (3) | (3) | Limestone, phosphate rock. |
| Pickett | 15,840 | ---------- | |
| Polk | (3) | (3) | Copper, pyrite, zinc, silver, gold, lead. |
| Putnam | (3) | (3) | Coal, limestone. |
| Rhea | 273,412 | 227,956 | Coal, sandstone, miscellaneous clay. |
| Roane | 680,533 | 765,599 | Limestone, iron ore, sandstone. |
| Robertson | (3) | (3) | Limestone. |
| Rutherford | 165,100 | 264,980 | Do. |
| Scott | 2,062,354 | 2,171,408 | Coal. |
| Sequatchie | 1,086,121 | (3) | Coal, limestone. |
| Sevier | 329,992 | 179,709 | Limestone. |
| Shelby | (3) | 1,636,170 | Sand and gravel, miscellaneous clay. |
| Smith | 35,084 | 66,804 | Limestone. |
| Stewart | 9,050 | ---------- | |
| Sullivan | (3) | (3) | Cement, limestone, miscellaneous clay, sand and gravel. |
| Sumner | 286,075 | 250,637 | Limestone, sand and gravel. |
| Tipton | (3) | (3) | Sand and gravel. |
| Unicoi | 940,623 | (3) | Manganese ore, sand and gravel, limestone. |
| Union | (3) | (3) | Marble. |

See footnotes at end of table.

Digitized by Google

**TABLE 21.—Value of mineral production in Tennessee, 1955–56, by counties [1]—Continued**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Van Buren | $389,359 | $333,204 | Coal. |
| Warren | 257,700 | (3) | Limestone. |
| Washington | (3) | (3) | Limestone, miscellaneous clay. |
| Wayne | 14,700 | (3) | Sand and gravel. |
| Weakley | (3) | (3) | Ball clay. |
| White | 263,699 | 1,179,514 | Coal, limestone. |
| Williamson | (3) | (3) | Phosphate rock, limestone. |
| Wilson | (3) | (3) | Limestone, fluorspar. |
| Undistributed [4] | 60,337,636 | 79,868,342 | |
| Total Tennessee | 119,316,000 | 137,846,000 | |

[1] The following counties are not listed because no production was reported: Cheatham, Chester, Clay, Crockett, Dyer, Gibson, Hamblen, Hancock, Hardin, Houston, Jackson, Lake, Lawrence, Lewis, Madison, Moore, and Trousdale.
[2] Petroleum and natural gas not listed by counties as data are not available; value included with "Undistributed."
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[4] Includes value of petroleum and natural gas and values indicated by footnote 3.

**Blount.**—John J. Craig Co. (Crisp, Hamil, Lee, and Marmor quarries) quarried dimension marble for rough and dressed building stone, and for cut, dressed monumental stone. Lambert Bros., Inc. (Calderwood quarry), and Sam Lambert & Sons crushed 421,000 tons of limestone for concrete and roads. John J. Craig Co. crushed marble for terrazzo.

**Bradley.**—Bradley Limestone Co., Inc. (Welch quarry), crushed 220,000 tons of limestone for agstone, concrete, and roads.

**Campbell.**—Sixty-eight companies mined 824,000 tons of coal; leading producers were New Jellico Coal Co. (Blue Rose mine), and Stoney Fork Coal Corp. (Clinchmore mine). Campbell County Highway Department and Key Limestone Division crushed limestone for concrete and roads, agstone, and asphalt filler. Silica Sand Co., Inc., mined 51,600 tons of paving, grinding, and other sand.

**Cannon.**—S. N. McPherson (Norvell quarry) crushed limestone for concrete and roads.

**Carroll.**—Kentucky-Tennessee Clay Co. mined ball clay for whiteware, floor and wall tile, firebrick and block, and kiln furniture.

**Carter.**—Watauga Stone Co. crushed 387,000 tons of limestone for concrete and roads, railroad ballast, and agstone. Virginia Iron, Coal & Coke Co. (Stoney Creek mine) mined Metallurgical-grade manganese ore. Blue Ridge Stone Co. crushed 40,000 tons of granite for concrete and roads.

**Claiborne.**—Thirty-four companies mined 404,000 tons of coal; leading producers were Pruden Coal & Coke Co. (Jellico No. 7 mine) and Dippel & Dippel Coal Co. (Dippel Strip mine).

**Cocke.**—Cocke County Highway Department (Briar Thickett and Burnett quarries) crushed 19,000 tons of limestone for concrete and roads.

**Coffee.**—Ralph Rogers & Co., Inc., crushed limestone for concrete and roads.

**Cumberland.**—Crab Orchard Stone Co., Inc. (Peck quarry), Crossville Stone Co., Hembree Stone Co., Knoxville Building Stone Co., James E. Roberts, and Turner Bros. Stone Co., Inc., quarried 42,000



Digitized by Google

tons of dimension sandstone for rough architectural and dressed building stone and for flagging. Fourteen companies mined 88,000 tons of coal; leading producers were C & F Coal Co. (No. 3 Strip mine) and Carl Wenzel Coal Co. (Jewett Strip mine). Cumberland County Highway Department and Southern States Lime Mfg. Co. (Crab Orchard quarry) crushed 211,000 tons of limestone for riprap, fluxing stone, concrete and roads, railroad ballast, agstone, glass, paper, rock dust for coal mines, mineral food, and other uses. Turner Bros. Stone Co., Inc., crushed sandstone for refractories.

**Davidson.**—Marquette Cement Mfg. Co. produced masonry and portland cements at the Nashville mill throughout the year. Davidson County Highway Department, Eller & Olson Crushed Stone Co., Inc., Franklin Limestone Co. (Danley and Old Hickory quarries), and Lambert Bros., Inc. (Hermitage quarry), crushed 1,559,000 tons of limestone for riprap, fluxing stone, concrete and roads, railroad ballast, agstone, asphalt filler, and rock dust for coal mines. Cumberland River Sand & Gravel Co. and T. L. Herbert & Sons mined structural and paving sand and gravel. W. G. Bush & Co., Inc., and L. T. Lewis & Sons mined miscellaneous clay for heavy clay products. Harsh Phosphate Co. mined 7,000 tons of marketable phosphate rock for fertilizer filler. Davidson County Highway Department quarried 1,800 tons of dimension limestone for building stone.

**Decatur.**—Tinker Sand & Gravel Co. mined structural sand and gravel.

**De Kalb.**—De Kalb County Highway Department (Sligo quarry) crushed 36,000 tons of limestone for concrete and roads.

**Dickson.**—Duke Lime & Stone Co. crushed limestone for concrete and roads, agstone, and other uses.

**Fayette.**—Fayette County Highway Department mined 73,000 tons of paving gravel.

**Fentress.**—Twenty-four companies mined 351,000 tons of coal; leading producers were Bruns Coal Co., Inc. (Wilder Strip and Auger mines), and Ulysess Johnson Coal Co. (Horsepound No. 1 mine). Frogge & Williams, Inc. (Wright quarry), crushed 171,000 tons of limestone for agstone, concrete, and roads. Jones Stone Co. (Nash quarry) quarried 5,600 tons of dimension sandstone for rough architectural building stone.

**Franklin.**—Marquette Cement Mfg. Co. produced portland and masonry cements at the Cowan mill throughout the year. Cowan Stone Co. (Anderson and Cowan quarries), Franklin County Highway Department (Bostick quarry), and Marquette Cement Mfg. Co. crushed 667,000 tons of limestone for fluxing stone, concrete and roads, railroad ballast, agstone, glass, cement, and other uses. Estill Springs Sand-Gravel Co. and Sewannee Silica Sand Co. mined glass, molding, structural, paving, blast, engine, and filter sand and structural, paving, and other gravel. Marquette Cement Mfg. Co. mined miscellaneous clay for use in cement.

**Giles.**—International Minerals & Chemical Corp. (Wales mine), Lancaster & Trice, and Monsanto Chemical Co. mined 225,000 tons of marketable phosphate rock for direct application to the soil, elemental phosphorus, and pig-iron blast furnaces. Cedar Grove Lime Co. crushed limestone for agstone, concrete, and roads. Giles County Highway Department mined 135,000 tons of paving gravel.

Digitized by Google

**Grainger.**—Imperial Black Marble Co. quarried 740 tons of dimension marble for interior rough building stone. Grainger County Highway Department (Capps quarry) crushed 7,600 tons of limestone for concrete and roads. National Lead Co. participated in 2 DMEA projects for zinc ores, amounting to $98,020, of which the Government share was 50 percent.

**Greene.**—Agricultural Lime Co., Inc., Greene County Highway Department (Ratcliffe quarry), and Malone Bros. Co. crushed limestone for concrete and roads. Malone Bros. Co., Nolichuckey Sand Co., and John Paul Russell mined 168,000 tons of structural and paving sand and gravel. International Minerals & Chemical Corp. recovered scrap mica at a new processing plant from silt deposited in Davy Crockett Lake.

**Grundy.**—Eighteen companies mined 420,000 tons of coal; the leading producer was Whitwell Coal Corp. Viola White Lime Co. crushed 15,000 tons of limestone for agstone, concrete, and roads.

**Hamilton.**—Signal Mountain Portland Cement Division of General Portland Cement Co. produced portland and masonry cements at the Signal Mountain mill throughout the year. Chattanooga Rock Products Co. and Signal Mountain Portland Cement Division crushed limestone for concrete and roads, agstone, and railroad ballast. Twenty-five companies mined 150,000 tons of coal; the leading producer was Walden Ridge Coal Co. (No. 1 and No. 2 Strip mines). Dixie Sand & Gravel Co. mined structural and paving sand and gravel. B. Mifflin-Hood Co., Key-James Brick Co., and Signal Mountain Portland Cement Division mined miscellaneous clay for cement and heavy clay products and for floor and wall tile.

**Hancock.**—New Jersey Zinc Co. continued to develop its new zinc mine near Flat Gap and expected to start production in 1957. Development work included 787 feet of shaft sinking and 3,012 feet of drifting. New Jersey Zinc Co. started two DMEA projects for zinc ores.

**Hardeman.**—Saulsbury Sand Co. and Tri-State Sand Co. mined structural sand.

**Hawkins.**—Lambert Bros., Inc. (McCloud quarry), crushed 29,000 tons of limestone for concrete and roads. New Jersey Zinc Co. started a DMEA project for zinc ores.

**Haywood.**—Haywood County Highway Department mined 78,000 tons of paving gravel.

**Henderson.**—Ayers Mineral Co. crushed sandstone for foundry uses.

**Henry.**—Dixie Brick & Tile Co., Kentucky-Tennessee Clay Co., and H. C. Spinks Clay Co. (Como, Henry, and Puryear mines) mined ball clay for whiteware, floor and wall tile, firebrick and block, and kiln furniture. Southern Clay Co., Inc. (Porters Creek mine), and Tennessee Absorbent Clay Co. mined 48,000 tons of fuller's earth for absorbent uses.

**Hickman.**—M. C. Boyle Phosphate Co. (Dean's Switch mine), W. P. McClanahan & Co., Owens Agricultural Phosphate Co., and M. C. West (Highland mine) mined 80,000 tons of marketable phosphate rock for direct application to the soil and for elemental phosphorus.

Digitized by Google

**Humphreys.**—Franklin Limestone Co. (Rock Hill quarry) and Patterson Stone Co. crushed 407,000 tons of limestone for riprap, concrete and roads, railroad ballast, and agstone. Sangravl Co., Inc., mined structural and paving sand and structural, paving, and railroal ballast gravel.

**Jefferson.**—American Zinc Co. of Tennessee (Athletic, Grasselli, North Friends Station, and Young mines), New Jersey Zinc Co. (Jefferson City mine), and Tennessee Coal & Iron Division of United States Steel Corp. (Zinc Mine Works) recovered zinc from zinc ores; exploration and development work by the 3 operating companies (exclusive of DMEA projects) included 480 feet of shaft sinking, 348 feet of raising, 7,245 feet of drifting, 82,956 feet of diamond drilling, 6,513 feet of churn drilling, and 4,098 feet of long-hole drilling. American Zinc Co. of Tennessee completed a DMEA project for zinc ores, which was begun in 1954, amounting to $1,017,000, and started another project for $768,170. New Jersey Zinc Co. began 2 DMEA projects for zinc ores amounting to $384,600. American Zinc Co. of Tennessee and Tennessee Coal & Iron Division crushed limestone as a byproduct from zinc mines, and the White Pine Stone Co. crushed limestone at its new quarry; this material was used for concrete and roads, railroad ballast, agstone, etc.

**Johnson.**—B & T Mining Co., Colitz Mining Co., Michael J. Colitz, Laurel Mining Co., Lon Tester, and Valley Mining, Ltd. (Blackburn and King mines), mined 9,100 tons of Metallurgical grade manganese ore for sale to the Government. Maymead Lime Co. crushed limestone for agstone, and concrete and roads.

**Knox.**—Volunteer Portland Cement Co. produced portland and masonry cements at the Knoxville mill throughout the year. American Zinc Co. of Tennessee (Mascot No. 2 mine) and S. W. Forney recovered zinc from zinc ores; exploration and development by these companies included 1,746 feet of drifting and 79,228 feet of diamond drilling. American Zinc Company of Tennessee recovered crushed limestone as a byproduct from zinc mining. American Limestone Co. (Holston and Midway quarries), Burkhart Quarry Supplies, Inc., Knoxville Lime Mfg. Co., Lambert Bros., Inc. (Biagotti, Freeway, Kennedy, Knoxville, Neubert's, and Tecoa quarries), Oliver King Sand-Lime Co., Inc., Standard Lime & Cement Co., Volunteer Portland Cement Co., and Williams Lime Mfg. Co. produced crushed limestone. Production was 2,156,000 tons; the stone produced by these companies was used for concrete and roads, railroad ballast, agstone, cement, lime, terrazzo, concrete blocks, etc. Appalachian Marble Co. (Appalachian and Bond Pink quarries), Gray Knox Marble Co. (Gray Knox quarry), and Tennessee Marble Co. (Eagle quarry) quarried 17,500 tons of dimension marble for rough and dressed building stone and for cut, dressed monumental stone. Knoxville Lime Mfg. Co., Standard Lime & Stone Co., and Williams Lime Mfg. Co. produced 124,500 tons of lime for building, agricultural, chemical and industrial uses. Knoxville Sangravl Materials Co., and Oliver King Sand-Lime Co. mined structural, paving, grinding, engine, railroad ballast, and other sands and structural and paving gravels. Appalachian Marble Co. and Knoxville Crushed Stone Co. crushed 8,200 tons of

Digitized by Google

marble for terrazzo and other uses. Cherokee Shale Brick Co., General Shale Corp., Shalite Corp., and Volunteer Portland Cement Co. mined 193,000 tons of miscellaneous clay for cement, lightweight aggregates, and heavy clay products.

**TABLE 22.—Crushed limestone sold or used by producers in Knox County, 1948–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1948–51 (average)[1] | (2) | $1,923,560 | 1954 | 1,997,365 | $2,382,607 |
| 1952 [1] | 1,725,685 | 2,251,609 | 1955 | 2,224,048 | 2,544,588 |
| 1953 [1] | 1,291,678 | 1,801,016 | 1956 | 2,155,541 | 2,602,673 |

[1] Except for cement or lime.
[2] Figure withheld to avoid disclosing individual company confidential data.

**Lauderdale.**—Lauderdale County Highway Department mined 72,000 tons of paving gravel.

**Lincoln.**—Clark & Stephenson crushed limestone for concrete and roads.

**Loudon.**—Lenoir Asphalt Paving Co., Inc., and Loudon County Highway Department crushed 75,500 tons of limestone for concrete and roads. Brooks Sand & Gravel Co. mined 41,600 tons of structural sand and gravel. Old Hickory Brick Co. mined 15,000 tons of miscellaneous clay for heavy clay products.

**Macon.**—Dixon & Stubblefield (Langford quarry) crushed limestone for concrete and roads, agstone, and cement.

**Marion.**—One hundred and fifty-three companies mined 2,205,000 tons of coal; leading producers were Tennessee Products & Chemical Corp. (Reels Cove and Daus Mountain mines) and Tennessee Consolidated Coal Co. (Coal Valley mine). Penn-Dixie Cement Corp. produced portland cement at the Richard City mill throughout the year. Cureton Lime & Stone Co. (Ketchall quarry), Penn-Dixie Cement Corp., and Signal Mountain Cement Division of General Portland Cement Co. (Bennetts Lake quarry) crushed limestone for concrete and roads, agstone, and cement.

**Marshall.**—Lewisburg Limestone Co. crushed limestone for agstone, concrete, and roads.

**Maury.**—Armour Fertilizer Works (McKennon mine), International Minerals & Chemical Corp. (Mt. Pleasant mine), Monsanto Chemical Co., Presnell Phosphate Co., J. T. Prince, Tennessee Valley Authority, Victor Chemical Works, Virginia-Carolina Chemical Corp., and six other producers mined phosphate rock for ordinary and triple superphosphate, direct application to the soil, fertilizer filler, other fertilizers, phosphoric acid, and elemental phosphorous. Columbia Rock Products Corp. (Theta Pike quarry) crushed limestone for concrete and roads.

**McMinn.**—McMinn County Highway Department and Floyd D. Webb Stone Co. crushed limestone for agstone, concrete, and roads.

**McNairy.**—Worsham Bros. mined 107,000 tons of structural and paving sand and gravel.

**Meigs.**—Gil Crouch and Posey & Caldwell crushed limestone for agstone, concrete, and roads.

Digitized by Google

**Monroe.**—National Lead Co. (Jones, and Stevens & Ballard mines) and B. C. Wood (Roy mine) mined barite for well drilling, glass, rubber, paint, and other uses. Creighead Limestone Co., and Monroe County Highway Department (Tallent quarry) crushed 106,000 tons of limestone for concrete and roads. Monroe Mining Co. (Wilson mine) mined brown iron ore for blast-furnace use.

**Montgomery.**—Clarksville Stone Co. and Simpson Stone Co. crushed limestone for agstone, concrete, and roads.

**Morgan.**—Twenty-three companies mined 486,000 tons of coal; leading producers were Brushy Mountain Coal Mines (Petros No. 3 and No. 7 mines), Allen Bros. Coal Co. (No. 6 Strip mine), and W. R. Parton Coal Co. (No. 1 Strip mine). Jones Stone Co. quarried 4,700 tons of dimension sandstone for rough architectural building stone.

**Obion.**—Obion County Highway Department mined 127,000 tons of paving gravel.

**Overton.**—Fifteen companies mined 48,200 tons of coal; the leading producer was Redbud Coal Co. (No. 1 mine). Livingston Lime Co. (East and South quarries) crushed limestone for concrete, roads, and fertilizer filler.

**Perry.**—Charlie Elkins crushed 52,000 tons of limestone for agstone, concrete, and roads. Parish & Parish Mining Co. mined marketable phosphate rock for sale to other phosphate-rock companies.

**Polk.**—Tennessee Copper Co., the leading mineral-producing company in the State, produced mixed sulfide ore at the Boyd, Burra, Calloway, Eureka, and Mary mines; the ore, concentrated in two flotation mills, yielded copper, pyrite, and zinc concentrates; gold and silver were recovered as byproducts from smelting the copper and zinc concentrates; the pyrite concentrate was roasted, yielding liquid sulfur dioxide, for use mainly in manufacturing sulfuric acid, and iron oxide, which was sintered for use by iron and steel plants. Production of recoverable copper was 10,449 tons, a new annual record; pyrite increased 10 percent over 1955; production of recoverable zinc increased 10 percent over 1955; silver recovery was 64,878 fine ounces; gold recovery was 189 fine ounces; and production of recoverable lead was 5 tons. Exploration and development by the company included 14,531 feet of drifting and 12,949 feet of diamond drilling.

**Putnam.**—Three companies mined 180,000 tons of coal; the leading producer was Clinchfield Coal Corp. (Meadow Creek mine). Algood Limestone Co. (Poteet quarry) and Dixon-Stubblefield Limestone Co. (Monterey quarry) crushed limestone for concrete and roads.

**Rhea.**—Four companies mined 42,200 tons of coal; the leading producer was Richard Kirkwood Fuel Co. (No. 1 mine). Wayne French (Fulcher quarry) quarried 4,000 tons of dimension sandstone for rough architectural building stone. W. S. Dickey Clay Mfg. Co. (Graysville Clay mine) mined 30,800 tons of miscellaneous clay for heavy clay products.

**Roane.**—A. B. Long Construction Co. (Swan Pond quarry) and Rockwood Slag Products Co. crushed limestone for concrete and roads. Rockwood Mining Co. (New Chamberlain mine) mined red iron ore for blast-furnace use. Hughlen Henry Stone Co. quarried 560 tons of dimension sandstone for rough architectural building stone.

**Robertson.**—Porter Brown Limestone Co. crushed limestone for concrete and roads.

Digitized by Google

**Rutherford.**—Bilbrey Rock Co. crushed 212,000 tons of limestone for concrete and roads, agstone, and other uses.

**Scott.**—Thirty-seven companies mined 657,000 tons of coal; the leading producers were Straight Fork Coal Co. (Straight Fork mine), Ace Mining Co. (West No. 1 Strip mine), and Laddie Coal & Mining Co. (Lassie No. 1 mine).

**Sequatchie.**—Fifty-seven companies mined 352,000 tons of coal; leading producers were Bluff Coal Co. (Bluff mine) and Nick Istock Coal Co. (No. 2 Strip mine). Dunlap Stone Co. crushed limestone for concrete and roads.

**Sevier.**—Lambert Bros., Inc. (Sevier quarry), crushed 128,000 tons of limestone for concrete and roads.

**Shelby.**—Banks Bros., Inc., Cordova Sand & Gravel Co., R. P. Harris Gravel Co., Hollywood Sand & Gravel Co., Inc., Marquette Cement Mfg. Co., Memphis Stone & Gravel Co., J. A. Smith & Sons Construction Co., and Tennessee Gravel Co. mined 1,574,000 tons of structural, paving, grinding, and other sand and structural, paving, and other gravel. John A. Denie's Sons Co. and Moss Lightweight Aggregate Co. mined 124,000 tons of miscellaneous clay for lightweight aggregates and heavy clay products.

**Smith.**—Oldham Limestone Co. (Rome quarry) crushed 54,000 tons of limestone for riprap, agstone, concrete, and roads.

**Sullivan.**—Penn-Dixie Cement Corp. produced portland and masonry cements at the Kingsport Mill throughout the year. Penn-Dixie Cement Corp., Standard Crushed Stone Co. (New Kingsport quarry), and Sullivan County Highway Department (Boozy Creek, Muddy Creek, and Walnut Hill quarries) crushed 1,042,000 tons of limestone for cement, concrete, and roads. General Shale Products Corp. (Kingsport mine) and Penn-Dixie Corp. mined miscellaneous clay for cement and for heavy clay products. Afton Good mined 2,700 tons of structural sand.

**Sumner.**—Pilot Knob Limestone Co. and Ralph Rogers Co., Inc., crushed limestone for concrete and roads. Sumner County Highway Department mined 94,900 tons of structural gravel.

**Tipton.**—Owens Sand & Gravel Co and Smiley Sand & Gravel Co. mined structural and paving sand and gravel.

**Unicoi.**—Haile Mines, Inc. (Bumpass Cove mine), and Lewis Mining Co. mined Metallurgical-grade manganese ore. Brooks Sand & Gravel Co. mined 268,000 tons of structural and paving sands and structural, paving, and railroad-ballast gravels. Standard Crushed Stone Co. (Okalona quarry) crushed 45,000 tons of limestone for concrete and roads.

**Union.**—Tennessee Marble Co. (Luttrell quarry) quarried dimension marble for dressed building stone and for cut, dressed monumental stone.

**Van Buren.**—Ten companies mined 84,000 tons of coal; the leading producer was Henry Bros. Coal Co. (No. 1 Strip mine).

**Warren.**—McMinnville Rock Co., Inc., and Warren Limestone Co. crushed limestone for riprap, agstone, concrete, and roads.

**Washington.**—Washington County Highway Department crushed 198,000 tons of limestone for concrete and roads. General Shale Products Corp. (Johnson City mine) mined miscellaneous clay for heavy clay products.

Digitized by Google

**Wayne.**—Clifton Towing Co. mined structural sand and gravel.

**Weakley.**—Bell Clay Co. (Collins mine), Cooley Clay Co. (Greenfield mine), Kentucky-Tennessee Clay Co., H. C. Spinks Clay Co., and United Clay Mines Corp. (No. 6 mine) mined ball clay for whiteware, art pottery, enamel, floor and wall tile, firebrick and block, and kiln furniture.

**White.**—Seven companies mined 259,000 tons of coal; the leading producer was Bruns Coal Co., Inc. (De Rossett Strip and Auger mines). Sparta Limestone Co., Thompson-Weinman & Co., and White County Highway Department crushed limestone for whiting, agstone, concrete, and roads.

**Williamson.**—Monsanto Chemical Co. mined marketable phosphate rock for elemental phosphorus. Franklin Limestone Co. and Williamson County Highway Department crushed 325,000 tons of limestone for agstone, and concrete and roads.

**Wilson.**—Lebanon Limestone Co. and Marquette Cement Mfg. Co. (Martha quarry) crushed limestone for cement and for concrete and roads. Tennessee Mineral Co., composed of individuals from the Western Kentucky fluorspar district. reopened the old Lebanon mine and shipped Metallurgical-grade fluorspar to Marion, Ky.

Digitized by Google

# The Mineral Industry of Texas

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and The University of Texas, Bureau of Economic Geology.

By F. F. Netzeband[1] and John T. Lonsdale[2]

THE ECONOMY of Texas owes much to its abundant reserves of minerals. In 1956 a record high value of $4.2 billion of mineral production in Texas was established as all sectors of the State's industrial and business environment continued to expand. Record highs likewise were achieved in employment, income, and sales (both wholesale and retail), as consumer and business confidence strengthened. Growth also was evidenced in the number of new establishments and in expansions to existing establishments especially in the petroleum, chemical, fabricated-metals, machinery, and transportation-equipment industries.

The ever-growing inter- and intra-state markets for oil and gas stimulated additional gains for Texas production. Texas oilfields produced a record 1.1 billion barrels of crude oil in 1956—5 percent greater than the previous 1955 record; Texas gasfields yielded a record 4.9 billion cubic feet of natural gas, 5.7 percent more than in 1955. To supply this record flow of "black gold," the industry completed 25,764 new wells (9 percent more than in 1955) and raised the total number of producing wells to 178,095. According to the American Petroleum Institute, this drilling activity helped to sustain the State's crude-oil reserve at 14,783 million barrels, representing nearly 50 percent of the Nation's total. The oil industry was able to increase its proved reserve at a higher rate than it produced during 1935–50. From 1950 to the present this rate has flattened out so that no radical change was evident in either production or reserves in 1950–56. While 1956 demand for refinery products improved generally over that in 1955, marked changes were noted in the demand pattern. Significant increases were realized for the higher octane motor fuels, for jet fuels, and for asphalts and road oils.

Natural-gas sales advanced nearly 8 percent over 1955 sales as demand rose for feed stock used in the petro-chemical industry, and for power and heat supplied to industry and to homes. The spectacular growth of the ethylene, polyethylene, and butadiene (rubber) industries of Texas was largely responsible for the 5-percent rise in gas marketed in the State.

The metal-mining and metallurgical industry maintained its firm position in the State and National economy. All commercial output of magnesium in the United States was produced in Brazoria County.

[1] Commodity-industry analyst, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] Director, Bureau of Economic Geology, The University of Texas, Austin, Tex.



Digitized by Google

**TABLE 1.—Mineral production in Texas, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Cement: | | | | |
| Masonry.....376-pound barrels | 817,253 | $2,728,253 | 731,840 | $2,625,510 |
| Portland.....do | 24,038,427 | 64,820,374 | 25,234,150 | 73,069,953 |
| Clays | [2] 3,096,959 | [2] 5,099,922 | [2] 3,146,201 | [2] 4,765,068 |
| Copper | 1 | 746 | | |
| Gem stones | ([3]) | 115,000 | ([3]) | 115,000 |
| Gypsum | 1,349,434 | 4,219,652 | 1,156,956 | 3,623,005 |
| Helium.....cubic feet | 139,396,988 | 2,271,642 | 145,830,220 | 2,364,325 |
| Iron ore (usable).....long tons, gross weight | 875,443 | ([4]) | ([4]) | ([4]) |
| Lime | 584,855 | 5,549,309 | 592,136 | 6,937,951 |
| Natural gas.....million cubic feet | 4,730,798 | 378,464,000 | 4,999,859 | 434,990,000 |
| Natural-gas liquids: | | | | |
| Natural gasoline and cycle products.....thousand gallons | 2,987,808 | 206,506,000 | 2,964,609 | 216,378,000 |
| LP-gases.....do | 3,450,430 | 110,414,000 | 3,731,047 | 144,745,000 |
| Petroleum (crude).thousand 42-gallon barrels | 1,053,297 | 2,989,330,000 | 1,107,508 | 3,097,390,000 |
| Salt (common) | 3,583,242 | 12,867,094 | 3,962,778 | 14,349,558 |
| Sand and gravel | 31,518,123 | 28,480,350 | 29,335,697 | 27,212,554 |
| Silver.....troy ounces | 126 | 114 | | |
| Sodium sulfate | 46,718 | 1,099,522 | ([4]) | ([4]) |
| Stone | 27,321,444 | 33,543,782 | 32,772,827 | 36,349,747 |
| Sulfur: | | | | |
| Frasch process.....long tons | 3,766,882 | 105,128,170 | 3,437,061 | 91,026,388 |
| Recovered elemental.....do | 114,989 | 3,143,606 | 140,164 | 3,865,252 |
| Talc and soapstone | 35,064 | 213,366 | 41,332 | 244,368 |
| Value of items that cannot be disclosed: Abrasive stone, native asphalt, bromine, feldspar, fuller's earth, graphite, lignite, magnesium chloride (for metal), magnesium compounds (except for metal), mercury, pumice, and values indicated by footnote 4 | | 50,069,384 | | 62,347,838 |
| Total Texas [5] | | 3,993,310,000 | | 4,211,282,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes certain clays, included with "Value of items that cannot be disclosed."
[3] Weight not recorded.
[4] Figure withheld to avoid disclosing individual company confidential data.
[5] Total has been adjusted to eliminate duplicating the value of clays and stone.

Brown-iron ores of Cass, Cherokee, and Morris Counties supplied a large part of the pig iron used by Texas manufacturing and fabricating industries. The State's 16 metallurgical plants continued to contribute significantly to the Nation's metal supply for such metals as aluminum, antimony, copper, lead, tin, and zinc.

The output of nonmetals reflected much of the counterbalancing influences of the State's 1956 construction industry. Notable gains occurred in the number of industrial, commercial, and public-works construction awards in contrast to the declining number of new starts in home building in 1956. Among the construction minerals, record high outputs were established for cement, clays, lime, and stone, while declines were reported for gypsum and sand and gravel. The output of salt and of sulfur increased, while sulfur shipments declined because of the more competitive and expanding Mexican sulfur industry. Consequently, domestic sulfur price was lowered during the year to meet this new competition.

In summary 1956 was a banner year for the Texas mineral industries. Output increased, employment and income rose, consuming and manufacturing industries expanded, and capital expenditures and bank credit grew. Likewise, demand trends showed that State markets were consuming greater amounts of the mineral output than hereto-

Digitized by Google

fore because of growths in population and in the number of new industries and businesses and to expansions of established industries.

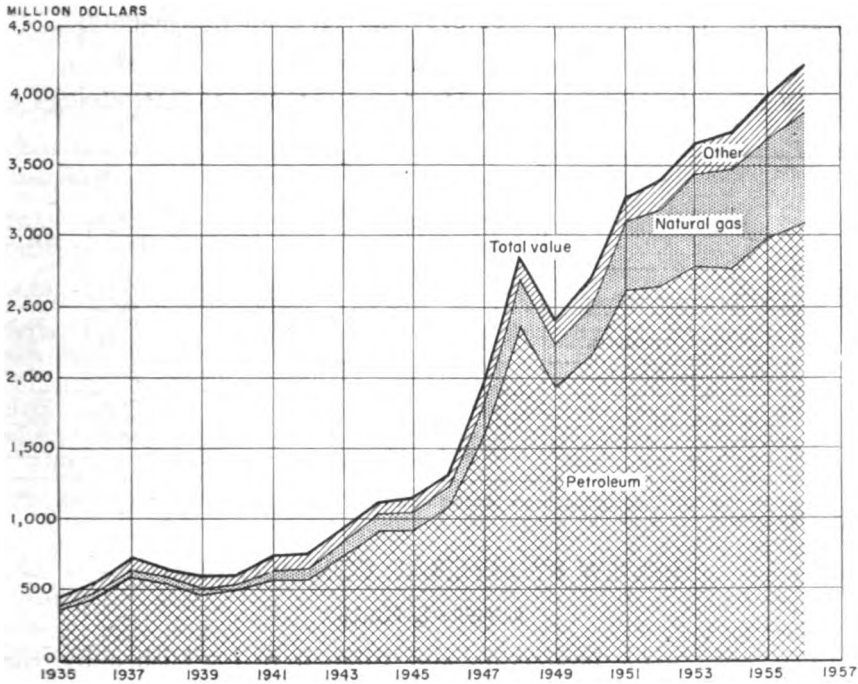



FIGURE 1.—Value of petroleum, natural gas, and total value of mineral production in Texas, 1935–56.

**TABLE 2.—Average unit value of selected mineral commodities produced in Texas, 1952–56**

| Commodity | | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Cement | 376-pound barrel | $2.42 | $2.53 | $2.58 | $2.70 | $2.90 |
| Gypsum (crude) | short ton | 2.63 | 2.68 | 3.10 | 3.13 | 3.13 |
| Helium | thousand cubic feet | 13.10 | 13.40 | 16.94 | 16.30 | 16.21 |
| Lime | short ton | 9.31 | 9.21 | 9.90 | 9.49 | 11.72 |
| Magnesium [1] | pound | .245 | .266 | .270 | .295 | .339 |
| Mercury [2] | 76-pound flask | 199.10 | 193.03 | 264.39 | 290.35 | 259.92 |
| Natural gas | thousand cubic feet | .062 | .076 | .085 | .080 | .087 |
| Natural-gas liquids: | | | | | | |
| Natural gasoline and cycle products | gallon | .073 | .073 | .073 | .069 | .073 |
| LP-gases | do | .036 | .039 | .032 | .032 | .039 |
| Petroleum | 42-gallon barrel | 2.58 | 2.73 | 2.84 | 2.84 | 2.83 |
| Salt | short ton | 1.67 | 1.76 | 3.25 | 3.59 | 3.63 |
| Sand and gravel: Commercial | do | 1.04 | 1.05 | 1.03 | 1.05 | 1.09 |
| Silver [3] | troy ounce | .905+ | .905+ | .905+ | .905+ | .905+ |
| Stone: | | | | | | |
| Limestone: | | | | | | |
| Crushed | short ton | 1.14 | .95 | 1.03 | 1.08 | .94 |
| Dimension | do | 13.45 | 33.84 | 22.54 | 31.02 | 33.07 |
| Miscellaneous: Crushed | do | .58 | .54 | .86 | .97 | .91 |
| Sandstone: | | | | | | |
| Crushed | do | .74 | .54 | .74 | 1.00 | .96 |
| Dimension | do | 17.40 | 12.76 | 8.45 | 7.22 | 2.81 |

[1] Average quoted price f. o. b., Freeport, Tex.
[2] Average quoted price at New York.
[3] Treasury buying price for newly mined silver; 1952–56—$0.9050505.

Digitized by Google

**Defense Minerals Exploration Administration (DMEA) Program.**—The Big Bend Mining Co., Inc., continued a diamond-drilling project to explore for mercury and uranium in Presidio County, Tex., under a DMEA contract for $132,000 (Government participation, 75 percent).

**TABLE 3.—Average employment, weekly hours worked, and weekly earnings in selected industries, 1955–56** [1]

| Industry | Employment | | Weekly hours worked | | Weekly earnings | |
|---|---|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 | 1955 | 1956 |
| Manufacturing | 446,100 | 471,900 | 42.1 | 41.4 | $75.78 | $80.32 |
| Primary metals | 25,900 | 26,300 | 41.2 | 40.0 | 86.52 | 87.60 |
| Chemicals | 43,400 | 46,100 | 42.5 | 42.8 | 89.68 | 97.16 |
| Petroleum and coal products | 47,600 | 47,800 | 40.4 | 40.4 | 99.38 | 107.06 |
| Machinery (oilfield) | 38,500 | 43,500 | 43.6 | 43.7 | 87.64 | 93.68 |
| Transportation equipment | 56,300 | 65,900 | 42.5 | 41.6 | 94.35 | 95.26 |
| Nonmanufacturing | 1,846,300 | 1,940,300 | | | | |
| Mining | 125,500 | 132,100 | 44.2 | 43.6 | 96.80 | 100.72 |
| Crude petroleum | 117,700 | 124,100 | 44.1 | 43.5 | 96.34 | 102.23 |
| Sulfur | 7,800 | 8,000 | 39.9 | 40.3 | 85.39 | 90.68 |
| Construction | 158,800 | 163,100 | | | | |

[1] Texas Employment Commission, in cooperation with U. S. Bureau of Labor Statistics, February and April 1957, 5 pp.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

New records for production and value were established by the mineral-fuels industries of Texas in 1956, reflecting the economic growth of the State and the Nation. The 1956 combined output of these industries—including crude oil, natural gas, natural-gas liquids, helium, and lignite—represented 93 percent of the State's total mineral value. Although the domestic oil industry experienced its biggest year in history, it took the Suez incident to relieve the oversupply situation, except for excessive gasoline stocks. For Texas alone, gasoline stocks rose 6.5 million gallons to 28.6 million from those of December 1955, according to the Railroad Commission of Texas. Stocks of all other products declined or approximated those of a year ago. Total domestic demand for all oil in 1956 was 9,228,000 barrels daily—4.1 percent higher than 1955; total exports were 16.6 percent greater.

Exploration for oil and natural gas continued to set records in 1956 as the industry was pressed to maintain its production-reserve ratio. This drilling activity led to important gas-distillate discoveries in the Ellenburger and Wolfcamp formations of West Texas, to oil discoveries on 2 more of the 18 known piercement salt domes in Wood and Anderson Counties of East Texas, and to discoveries in the Deep Edwards in Atascosa, McMullen, and La Salle Counties of Southwest Texas. Tidelands activity was devoted mainly to competition for leases by major producers and large independent producers.

In the tidelands 36 wells were drilled in 1956, making a grand total of 80 completions offshore. This grand total included 13 producing oil wells, 6 producing gas wells, 1 shut-in oil well, 17 shut-in gas wells,

Digitized by Google

and 43 dry holes. Offshore production approximated 200,000 barrels of oil and 133 million cubic feet of gas per year.

The total refining capacity of Texas increased 7 percent to 2.6 million barrels per stream-day in 1956 according to The Oil and Gas Journal. This added throughput capacity proved greater than the rise in effective products demand, because excessive gasoline stocks throughout the year resulted in curtailment of some refinery activity. During the latter part of the year the Middle East crisis did much to relieve this unbalanced supply-demand situation. Approximately 31,000 miles of trunk pipelines was in operation in 1956, according to the Railroad Commission of Texas—a moderate decline from the 1955 total mileage. In addition, the State had approximately 22,500 miles of gathering lines.

A notable development in the Gulf Coast area of the State was the 1,000 miles of pipelines built to supply fuel and products to the rapidly expanding petrochemical industry. The State had 50 common-carrier pipelines that performed both gathering and trunk services in 1956 compared with 43 in 1955. Yet, trunk-pipeline capacity to the Gulf coast terminals, particularly from the West Texas and Southeast New Mexico oilfields, proved inadequate during the Middle East crisis.

Output of helium and lignite increased, in line with the advancing national demand for basic raw materials.

**Asphalt, Native.**—Uvalde County supplied all the native asphalt produced in Texas in 1956; this output approximated that of 1955 and was used primarily for road surfacing.

**Carbon Black.**—The carbon-black industry of Texas recovered 989 million pounds valued at $68 million in 1956. This output—4 percent greater than in 1955—represented 58 percent of the entire domestic production. The industry consumed 154,580 million cubic feet of natural gas for an average yield of 2.04 pounds of material per thousand cubic feet of gas. Nearly 70 percent of the production was used as a filler and conditioner by the rubber industry. Considerable quantities also were used in the ink and paint industries.

Twenty-four carbon-black plants were active in 1956 (12 contact and 12 furnace type) compared with 25 in 1955. Plants in the Panhandle counties—Carson, Gray, Hutchinson, Moore, and Wheeler—supplied 56 percent of the State's output.

**Helium.**—Texas continued to be a principal domestic source of helium in 1956, with an output of 123 million cubic feet valued at nearly $2.0 million—1 percent greater than in 1955. Federal agencies, including the military establishment, the Weather Bureau, and

**TABLE 4.—Helium production, 1955–56, by counties**

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Production (cubic feet) | Value | Production (cubic feet) | Value |
| Moore | 89,336,700 | $1,449,756 | 89,969,500 | $1,458,676 |
| Potter | 32,491,167 | 534,090 | [1] 33,054,983 | 535,920 |
| Total | 121,827,867 | 1,983,846 | 123,024,483 | 1,994,596 |

[1] Does not include 24,865,028 cubic feet of helium withdrawn from conservation well in Government-owned Cliffside gasfield.

Digitized by Google

the Atomic Energy Commission, consumed the major part of the 1956 output as they have for the past several years.

**Lignite.**—Lignite production in Texas was greater in 1956 than in 1955.

**Natural Gas.**—Marketed production of natural gas in Texas in 1956 was a record 5,000,000 million cubic feet valued at $435 million, an increase of nearly 6 percent compared with 1955 production. Of the total, 2,750,000 million cubic feet was consumed out-of-State, 2,324,000 million cubic feet marketed within the State, and 154,580 million cubic feet was used in manufacturing carbon black. Gas wells produced nearly 70 percent of Texas's natural gas and oil wells the remainder. An average of 12,600 gas wells was producing in 1956 compared with 11,400 wells in 1955 according to the Railroad Commission of Texas. Also, 1,765 of the 25,764 wells completed in Texas in 1956 were gas wells.

Natural-gas reserves were estimated to total 112,728,750 million cubic feet or 47 percent of the national reserve, according to the American Gas Association. Texas tideland fields were proving an enormous new gas reserve. Much of this potential remained to be proved, because the completed wells were shut in for lack of pipeline connections and because the strikes were not developed.

**TABLE 5.—Marketed production of natural gas, 1947–51 (average) and 1952–56** [1]

| Year | Million cubic feet | Value (thousand dollars) | Value per thousand cubic feet (cents) | Year | Million cubic feet | Value (thousand dollars) | Value per thousand cubic feet (cents) |
|---|---|---|---|---|---|---|---|
| 1947–51 (average) | 2,755,817 | 129,358 | 4.7 | 1954 | 4,551,232 | 386,855 | 8.5 |
| 1952 | 4,147,805 | 257,164 | 6.2 | 1955 | 4,730,798 | 378,464 | 8.0 |
| 1953 | 4,383,158 | 333,120 | 7.6 | 1956 | 4,999,889 | 434,990 | 8.7 |

[1] Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

**Natural-Gas Liquids.**—The natural-gas-liquids industry of the Nation, particularly those of Texas and Louisiana, faced a serious oversupply situation during most of 1956. LP-gas stocks at the end of 1956 at plant terminals and in underground storages were twice those reported at the end of 1955. PAD District 3, which includes Texas and Louisiana, had nearly 80 percent of all these LP-gas stocks. Natural-gasoline stocks also showed moderate gains, but these surpluses were not as serious to the industry as were LP-gas stocks.

Production of natural-gas liquids amounted to a record 18 million gallons per day—up 3.6 percent from the 1955 output. LP-gases represented 55 percent of this output; natural gasoline and cycle products supplied the remainder. In 1956, 204 natural-gasoline plants and 31 cycle plants were operating in Texas.

The 1956 prices for natural gasoline reflected the stock situation throughout the year. Average plant price for grade 26–70 natural gasoline was somewhat higher during the first quarter of 1956. Then, depressing influences from ever mounting stocks held prices to the summer range throughout the remainder of the year with the average

Digitized by Google

plant price closing at 4.29 cents. This was 0.34 cent a gallon less than the 1955 average.

The proved recoverable reserve of natural-gas liquids in Texas was estimated at 3,380 million barrels as of December 31, 1956, according to the Committee of Natural-Gas Liquid Reserves of the American Gas Association, 335 million barrels or 11 percent more than in 1955.

**TABLE 6.—Production of natural-gas liquids, 1947–51 (average) and 1952–56**

| Year | Natural gasoline and cycle products | | LP-gases | | Total | |
|---|---|---|---|---|---|---|
| | Thousand gallons | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) | Thousand gallons | Value (thousand dollars) |
| 1947–51 (average) | 2,060,261 | 151,985 | 1,418,773 | 51,562 | 3,479,034 | 203,547 |
| 1952 | 2,589,594 | 188,500 | 2,456,874 | 88,635 | 5,046,468 | 277,135 |
| 1953 | 2,750,370 | 200,479 | 2,777,880 | 109,131 | 5,528,250 | 309,610 |
| 1954 | 2,732,100 | 200,559 | 2,983,962 | 95,913 | 5,716,062 | 296,472 |
| 1955 | 2,987,808 | 206,506 | 3,450,430 | 110,414 | 6,438,238 | 316,920 |
| 1956 | 2,964,609 | 216,378 | 3,731,047 | 144,745 | 6,695,656 | 361,123 |

**Petroleum.**—The petroleum industry of Texas and of the Nation ended 1956 in an expansive mood, notwithstanding grave problems which were depressing oil markets. Texas oil problems included holding oil allowables to 190 operating days, compared with 194 in 1955; pipeline prorations by companies unable to absorb their share of oil nominations; the growing number of nonconnected wells, both oil and gas; and excessive stocks of both crude and products. Despite the oversupply situation, the petroleum industry of Texas established new operating records in 1956, reflecting the high-level economy of the State and of the Nation during the year.

Crude-oil output increased 5.2 percent to 1.1 billion barrels, and refinery throughout increased 7.2 percent to 3,031 barrels per day to satisfy the 5.6 percent rise in demand for domestic crude to an average of 7.15 thousand barrels per day.

The total crude-oil capacity of Texas refineries was 2,508,400 barrels per day; of this, 2,398,300 barrels capacity was operating as of January 1, 1957.

Crude-oil stocks as of December 1956, declined 5.2 percent to 94,440 thousand barrels from those of December 1955, and 4.6 percent lower than November 1956, stocks. This moderate drop was due to the temporary increase in crude exports to Europe brought about by the Suez incident.

The wholesale price index of petroleum and petroleum products was 120.9 for December 1956 compared with 115.6 for December 1955, according to the Bureau of Labor Statistics.

Crude oil was produced in 194 Texas counties, of which 116 reported more than 1 million barrels each. The 10 leading counties, in order of output, were Andrews, Ector, Gregg, Scurry, Rusk, Harris, Crane, Brazoria, Gaines, and Wood.

Texas had 178,095 producing oil wells at the end of 1956, an increase of 10,332 or 6.5 percent over 1955. Average daily production amounted

Digitized by Google

to 17.9 barrels per well in 1956, compared with 18.4 barrels per well in 1955. In 1956, 25,764 wells were completed in Texas—an increase of 9.4 percent over the 23,540 wells completed in 1955, according to the Railroad Commission of Texas. Of the total wells drilled during the year, 5,379 were wildcat wells, of which 564 were completed as oil wells, and 134 as gas wells, and 4,681 were dry holes. Of the 20,385 development wells drilled during 1956, 15,422 were completed as oil wells, 1,631 were completed as gas wells, and 3,332 were dry holes. This drilling campaign led to three important events: (1) An impressive number of good oil, gas, and distillate discoveries in the Ellenburger and the Devonian formations on the Central Basin Platform of West Texas, (2) oil strikes on 2 previously condemned salt domes in East Texas, and (3) 6 Deep Edwards strikes of the Lower Cretaceous trend in Southwest Texas.

**TABLE 7.—Production of crude petroleum, 1947–51 (average) and 1952–56**

| Year | Thousand 42-gallon barrels | Value | | Year | Thousand 42-gallon barrels | Value | |
|---|---|---|---|---|---|---|---|
| | | At wells (thousand dollars) | Average per barrel | | | At wells (thousand dollars) | Average per barrel |
| 1947–51 (average) | 861, 737 | 2, 129, 006 | $2.47 | 1954 | 974, 275 | 2, 768, 490 | $2.84 |
| 1952 | 1, 022, 139 | 2, 641, 860 | 2.58 | 1955 | 1, 053, 297 | 2, 989, 330 | 2.84 |
| 1953 | 1, 019, 164 | 2, 777, 900 | 2.73 | 1956 | 1, 107, 808 | 3, 097, 390 | 2.80 |

The proved recoverable reserve of crude oil in Texas declined 150 million barrels to 14.8 billion barrels, according to the American Petroleum Institute. Oil discoveries from exploratory drilling added 164.5 million barrels to proved reserves, while development drilling added 762.9 million barrels. Texas had 48.6 percent of the total United States oil reserve and 50 percent of the total liquid-fuel reserve, which includes gas liquids.

Indicated demand for crude oil in Texas in 1956 amounted to 1,116 million barrels compared with 1,045 million barrels in 1955.

Crude-oil stocks in Texas as of December 31, 1956, amounted to 94.4 million barrels, of which 71.8 million barrels was in pipelines and tank farms, 6.8 million barrels was in lease tanks, and 15.8 million barrels was in storage at refineries.

**TABLE 8.—Production and indicated demand of crude petroleum in 1956, by months**

(Thousand barrels)

| Month | Production | Indicated demand | Month | Production | Indicated demand |
|---|---|---|---|---|---|
| January | 95, 400 | 97, 353 | August | 95, 864 | 93, 566 |
| February | 89, 260 | 90, 108 | September | 89, 666 | 88, 720 |
| March | 96, 058 | 94, 813 | October | 90, 012 | 89, 894 |
| April | 90, 665 | 87, 621 | November | 90, 155 | 94, 294 |
| May | 92, 512 | 93, 064 | December | 95, 127 | 101, 650 |
| June | 89, 623 | 95, 580 | | | |
| July | 93, 466 | 92, 304 | Total: 1956 | 1, 107, 808 | 1, 115, 967 |
| | | | 1955 | 1, 053, 297 | 1, 044, 712 |

Digitized by Google

**TABLE 9.—Sales of petroleum products, 1952–56**

(Thousand barrels)

| Product | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Gasoline | 93,663 | 109,848 | 106,245 | 105,672 | 107,045 |
| Kerosine | 2,921 | 2,638 | 2,383 | 2,309 | 2,250 |
| Range oil [1] | 2,386 | 2,205 | 1,963 | 1,941 | 1,813 |
| Distillate fuel oil | 19,022 | 19,046 | 18,913 | 20,728 | 22,258 |
| Residual fuel oil [2] | 44,631 | 40,981 | 35,436 | 37,512 | 37,399 |

[1] Includes kerosine sold as range oil.
[2] Excludes crude oil used as residual fuel oil as follows: 1952—1,877, 1953—997, 1954—876, 1955—596, and 1956—484.

**TABLE 10.—Runs to stills and output of refineries, in 1956, by months**

(Thousand barrels)

| Month | Runs | | | Output | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Crude | Products | Rerun | Gasoline | Kerosine | Fuel oil | | Jet fuel | Miscellaneous |
| | | | | | | Distillate | Residual | | |
| January | 67,781 | 4,697 | 577 | 33,724 | 4,543 | 18,010 | 8,619 | 1,142 | 7,017 |
| February | 66,697 | 4,007 | −1,184 | 31,077 | 4,311 | 17,505 | 8,314 | 1,379 | 6,934 |
| March | 69,822 | 4,731 | −902 | 33,937 | 3,700 | 18,134 | 8,478 | 1,597 | 7,805 |
| April | 66,123 | 4,805 | −211 | 33,306 | 3,091 | 17,104 | 8,195 | 1,137 | 7,884 |
| May | 71,287 | 4,944 | −2,020 | 35,306 | 3,300 | 16,526 | 8,877 | 1,532 | 8,670 |
| June | 69,590 | 4,833 | −1,017 | 35,371 | 3,017 | 16,861 | 8,553 | 1,355 | 8,249 |
| July | 67,789 | 5,170 | −632 | 34,730 | 3,151 | 16,202 | 8,538 | 1,428 | 8,278 |
| August | 69,437 | 5,471 | −311 | 35,685 | 3,644 | 17,079 | 8,252 | 1,638 | 8,299 |
| September | 66,786 | 5,266 | −1,410 | 33,768 | 3,740 | 16,089 | 8,041 | 1,557 | 7,447 |
| October | 64,645 | 5,707 | 371 | 33,615 | 4,065 | 15,940 | 7,860 | 1,596 | 7,647 |
| November | 66,794 | 5,543 | −2,100 | 32,485 | 4,322 | 16,362 | 8,148 | 1,593 | 7,327 |
| December | 69,085 | 5,809 | −64 | 34,218 | 4,050 | 18,165 | 9,037 | 2,009 | 7,351 |
| Total | 815,836 | 60,983 | −8,903 | 407,222 | 44,934 | 203,977 | 100,912 | 17,963 | 92,908 |

**TABLE 11.—Stocks of crude petroleum at refineries, in pipelines, tank farms, and gathering systems in 1956, by months**

(Thousand barrels)

| Month | Refineries | Tank farms and pipelines | Lease tanks | Total |
|---|---|---|---|---|
| January | 16,217 | 75,565 | 6,745 | 98,527 |
| February | 15,722 | 72,275 | 6,735 | 94,732 |
| March | 16,076 | 74,573 | 6,075 | 96,724 |
| April | 17,125 | 77,551 | 6,170 | 100,846 |
| May | 15,754 | 76,390 | 6,785 | 98,929 |
| June | 15,043 | 74,992 | 6,935 | 96,970 |
| July | 16,577 | 75,726 | 7,035 | 99,338 |
| August | 16,317 | 77,204 | 6,960 | 100,481 |
| September | 16,239 | 77,437 | 7,105 | 100,781 |
| October | 17,565 | 79,487 | 7,275 | 104,327 |
| November | 15,490 | 76,358 | 7,165 | 99,013 |
| December | 15,778 | 71,837 | 6,825 | 94,440 |

Texas had 56 oil refineries in 1956, with a total daily crude capacity of 2.5 million barrels. Most of this capacity was in the Gulf Coast region centering around Corpus Christi, Houston, and Beaumont areas. Refinery expansions and changes in methods and processes that occurred in 1956 are discussed in the County Review section.

465877—58——68

Digitized by Google

**TABLE 12.—Stocks of refined products at refineries in 1956, by months**

(Thousand barrels)

| Month | Gasoline [1] | Kerosine | Fuel oil | | Jet fuel | Natural gasoline | Miscellaneous products |
|---|---|---|---|---|---|---|---|
| | | | Distillate | Residual | | | |
| January | 34,649 | 2,540 | 10,555 | 8,039 | 974 | 409 | 21,294 |
| February | 38,133 | 2,590 | 7,965 | 6,977 | 1,161 | 524 | 21,752 |
| March | 35,591 | 2,865 | 8,473 | 6,227 | 1,030 | 465 | 22,391 |
| April | 34,317 | 2,962 | 10,571 | 6,787 | 1,046 | 691 | 22,268 |
| May | 32,297 | 3,545 | 12,970 | 6,593 | 1,183 | 888 | 22,860 |
| June | 31,732 | 4,091 | 15,504 | 7,315 | 1,186 | 1,171 | 23,149 |
| July | 31,294 | 3,884 | 17,373 | 8,178 | 849 | 1,256 | 22,920 |
| August | 30,651 | 3,999 | 18,983 | 7,765 | 1,173 | 1,436 | 22,376 |
| September | 31,634 | 4,383 | 20,445 | 8,638 | 1,019 | [2] 414 | 22,785 |
| October | 32,666 | 3,918 | 19,512 | 8,923 | 903 | 543 | 21,057 |
| November | 32,263 | 4,291 | 22,672 | 8,145 | 1,041 | 498 | 23,244 |
| December | 33,674 | 3,466 | 13,712 | 7,491 | 1,455 | 551 | 22,402 |

[1] Includes naphtha.
[2] An underground storage of liquefied gas formerly included in this table has been transferred to the natural-gas-liquids report.

**TABLE 13.—Daily average production and runs to stills of petroleum in 1955–56**

(Thousand barrels)

| Month | 1955 | | 1956 | |
|---|---|---|---|---|
| | Crude production | Runs to stills | Crude production | Runs to stills |
| January | 2,971 | 2,049 | 3,077 | 2,187 |
| February | 2,966 | 2,151 | 3,076 | 2,300 |
| March | 2,996 | 2,127 | 3,099 | 2,252 |
| April | 2,993 | 2,052 | 2,925 | 2,204 |
| May | 2,833 | 2,056 | 2,984 | 2,300 |
| June | 2,725 | 2,058 | 2,891 | 2,320 |
| July | 2,720 | 2,065 | 3,015 | 2,187 |
| August | 2,722 | 2,120 | 3,092 | 2,240 |
| September | 2,784 | 2,045 | 2,892 | 2,226 |
| October | 2,888 | 2,055 | 2,904 | 2,085 |
| November | 2,989 | 2,191 | 2,908 | 2,227 |
| December | 3,048 | 2,166 | 3,069 | 2,229 |

Texas refineries charged 816 million barrels of crude oil to stills during the year, up roughly 52 million barrels from 1955. Refinery production increased from 814 million barrels in 1955 to 868 million barrels in 1956. The bulk of the increase was in gasoline output, up to about 407 million barrels compared with 372 million barrels in 1955. This increase in gasoline output prevented the industry from depleting these excessive stocks during the year.

## METALS

Though iron ore, magnesium, and mercury were the only metals mined in Texas in 1956 and their value was small compared with the total mineral value of the State, there was an imposing array of metallurgical plants in the State which processed ores and other materials mined in other States and foreign countries.

A wide variety of metals or their compounds, was recovered at Texas plants. These included aluminum, antimony, cadmium, copper, gold and silver, iron, lead lithium (hydroxide), magnesium (both metal and compounds), tin, and zinc. Major markets for

Digitized by Google

metals produced in Texas, except iron, still were out of State even though the metals fabricating industry of Texas was growing rapidly.

**Aluminum and Bauxite.**—The aluminum industry of Texas, which began production in 1950 with a total yearly capacity of 57,000 tons, made the State the second ranking producer in the Nation in 1956, when the rated capacity reached 365,000 tons of metal yearly. Expansion programs of The Aluminum Company of America consisted of an alumina plant adjacent to the Point Comfort reduction works, deepening of a channel through Lavaca Bay to accommodate ore vessels that carry Surinam bauxite to the new alumina plant, and an $11 million expansion to the Point Comfort reduction works. The added facility at Point Comfort was to include a seventh potline, with an annual capacity of 20,000 tons of metal. Reynolds Metals Co. enlarged its La Quinta alumina plant near Corpus Christi at a cost of about $30 million. This was to provide an annual capacity of 548,000 tons of alumina (an increase of 185,000 tons) extension of the pier adjacent to the alumina plant, dredging of a channel for ore vessels, and added bauxite-storage facilities.

The price of aluminum metal opened 1956 at 24.4 cents a pound and rose to 25.9 cents in March and to 27.1 cents in August.

**Antimony.**—Antimony from ores and concentrates imported from Mexico and Bolivia was recovered at the Laredo smelter of National Lead Co. Smelter output in 1956 was greater than in 1955, commensurate with a modest rise in consumption. The principal uses for the metal were: Antimonial lead for batteries, bearing metals, and frits; and as pigment in ceramic enamels and paints and lacquers. The price of the domestic metal (f. o. b. Laredo, Tex.) remained unchanged at 33 cents a pound throughout 1956.

**Copper.**—Blister copper was produced at the El Paso copper smelter of the American Smelting and Refining Co. from ores and concentrates from Western States and foreign countries. Fire-refined copper and electrolytic-grade copper were produced at the Nichols refinery of Phelps Dodge Refining Corp. at El Paso.

**Iron and Iron Ore.**—The 1956 output of iron ore from open pits in Cass, Cherokee, and Morris Counties was somewhat larger than in 1955. The ore was shipped to one blast furnace in Daingerfield and to another in Houston. Both blast furnaces were basic units of integrated steel mills operated by Lone Star Steel Co. and Sheffield Steel Division of Armco Steel Corp. Ore from Mexico and from South America supplemented domestic ore as blast furnace feed. These blast furnaces and the steel mills operated above rated capacities in 1956 as demands for oil-country goods remained high. Construction of a $1 million heat-treating plant began during the first of the year at the Houston plant of Sheffield Steel Co.

Lone Star Steel Co. began construction of a fifth open-hearth furnace, which will add about 20 percent to its ingot capacity. The company mineral reserves were increased by the acquisition of additional iron-ore leases in Texas and of coal properties in Oklahoma.

**Lead.**—Lead ores and concentrates from Western States and from Mexico were processed into base bullion at the El Paso lead smelter of American Smelting and Refining Co. Seven secondary lead smelters in Texas also treated scrap material. Demand for antimonial lead for storage batteries was off considerably from 1955, and purchases for

Digitized by Google

Government stockpiling were much greater. The 1956 price of lead opened at 16 cents per pound, rose to 16.5 cents on January 4, and dropped back to 16 cents on January 13, where it remained for the rest of the year.

**Magnesium.**—Magnesium—the lightest of structural metals—was produced from sea water by Dow Chemical Co. Sea water contains an average of 0.13 percent magnesium and offers an unlimited reserve of this strategic metal. Dow Chemical Co. operated both its electrolytic plant at Freeport and the Government-owned plant at Velasco. A slight increase in demand in 1956 permitted Dow Chemical Co. to operate both plants at capacity. Both were closed by a 31-day labor strike in July and August.

The use of magnesium as an alloying constituent with aluminum and as a reducing agent to produce titanium increased during 1956. Appreciable quantities of the metal were likewise consumed in die-casting parts for automobiles, in business machines and handtools, and for cathodic protection of iron and steel in ships and marine equipment, in industrial boilers and in pipelines. The 1956 price of primary magnesium opened at 32.5 cents per pound, f. o. b. Velasco, Tex., rising to 33.75 cents per pound on April 16. It rose to 35.25 cents per pound on August 13 and remained at that price to the close of the year.

**Manganese.**—Imported manganese ore was smelted at the Houston plant of Tenn-Tex Alloy & Chemical Corp. to produce ferromanganese. The bulk of this alloy was used as an additive for the expanding Texas steel industry; the remaining minor quantity was shipped outside the State for similar uses.

**Mercury.**—Exploration and development programs for mercury in the Terlingua district accounted for a slight increase in recovery in 1956 over that of 1955. The price of mercury at New York opened the year at a range of $275–$279 a flask and, after moderate declines during the year, it closed at $255–$257, averaging $259.92 for the year.

**Tin.**—Output at the Longhorn tin smelter at Texas City amounted to 17,631 long tons of tin in 1956 compared with 22,329 long tons in 1955. This smelter continued as the only source of primary refined tin in the Western Hemisphere, and all of its production was consigned to Government stockpile.

**Zinc.**—A considerable part of the Nation's primary and secondary zinc-smelting capacity was in Texas. Three primary plants (2 horizontal retort and 1 electrolytic) processed foreign and Western States ores and concentrates; secondary smelters, in Fort Worth-Dallas and in the Houston-Beaumont areas, treated scrap material. Texas zinc smelters operated at near capacity as domestic consumption and Government acquisitions for stockpiling continued at high levels. Galvanizing and die casting remained the principal uses of zinc, accounting for 79 percent of the total slab zinc produced. Stocks of slab zinc at smelters increased during the year while consumer inventories declined.

The average 1956 zinc price, East St. Louis, was 13.5 cents per pound compared with 12.3 cents per pound in 1955. Zinc metal opened at 13.0 cents at the beginning of the year then rose to 13.5 cents on January 6, at which level it remained throughout the year.

Industry expansion included additions to the zinc fuming and other

Digitized by Google

facilities of the Corpus Christi electrolytic zinc smelter of the American Smelting and Refining Co. These new facilities raised the plant capacity to 100,000 tons of metal per year and were placed in operation in September. Installation of new mechanical charging machines on all furnaces of the Machovec retort smelter of the American Zinc Co. of Illinois at Dumas permitted about 30-percent increase in production.

**Uranium.**—Exploration programs by oil and mining companies led to discovery of considerable reserves of uranium ore in Karnes, Duval, and Gonzales Counties. The industry's pressing problem was whether the reserves warranted construction of a mill or a purchasing depot.

## SECONDARY METALS]

**Iron and Steel Scrap.**—Scrap was an important supply for the Texas iron and steel industry as evidenced by the fact that this industry consumed 2.1 percent of the Nation's scrap in 1956 but only 0.9 percent of the Nation's pig iron. Of the 1.7 million tons of ferrous scrap consumed within the State, the major part was purchased by the users from scrap dealers.

**TABLE 14.—Consumption of ferrous scrap and pig iron, 1955–56**

| Year | Total scrap (short tons) | Pig iron (short tons) | Total scrap and pig iron (short tons) |
|---|---|---|---|
| 1955 | 1,671,036 | 749,298 | 2,420,334 |
| 1956 | 1,704,464 | 675,432 | 2,379,896 |

**Lead Scrap.**—Texas had appreciable secondary lead-smelting capacity. These plants processed lead scrap, battery plates, bearing metal, and other alloys into refined and antimonial lead and alloys, such as babbitt and solder. Secondary lead smelters in Texas were: Houston Fishing Tackle Co., Magnus Metal Co., and Houston Lead Co., at Houston; Southern Lead Co. and National Lead Co., at Dallas; Magnus Metal Co. and National Metal & Smelting Co., at Fort Worth; Standard Electric Co., at San Antonio, and Wilkinson Bros. Smelting Co., at Laredo. Secondary lead represented 59 percent of the total domestic supply of lead in 1956.

## NONMETALS

The 1956 value of nonmetal production approximated $288 million, or 7 percent of total mineral value. Eighteen nonmetal commodities were produced in 1956, the same as in 1955. The five principal commodities, in order of value, were: Sulfur, cement, stone, sand and gravel, and magnesium chloride (used for metal). Production increases were reported for 12 of these nonmetal commodities, declines were noted for 4, and 2 approximated their 1955 records.

Virtually all of the nonmetal minerals were produced for local markets because of their bulk weight and low unit price, the one major exception being sulfur. Industrial expansion, an expanded highway program augmented by funds of the Federal Aid Highway Act of 1956, and increases in defense operations in Texas all con-

Digitized by Google

tributed to the accelerated tempo of the construction industry. Texas—with 29,000 miles of the interstate National Highway system—received the second contract awarded under the Federal Aid Highway program. Federal funds amounting to $270 million were allocated for the interstate system with $122 million more granted for primary, secondary, and urban road systems under this program.

**Abrasives (Grinding Pebbles).**—Grinding pebbles from open pits in Travis County were recovered and prepared by Dezendorf Marble Co.

**Barite.**—Crude barite from foreign countries and other States was processed at grinding plants in Cameron, Harris, and Nueces Counties. Most of the material was prepared as a drilling mud for the oil and gas industry. Although the 1956 output approximated that in 1955, production might have been greater if a 5-week steel strike had not drastically reduced oil-country goods for drilling.

**Bromine.**—The 1956 output and value of bromine was greater than that of 1955 as the demand for ethylene-dibromide, a gasoline antiknock fluid, continued its upward trend. This increased demand was attributed to the higher compression engines and higher octane fuels of the automotive engines. Ethyl-Dow Chemical Co., the Nation's foremost producer of bromine, expanded its capacity by 20 percent.

**Cement.**—The Texas cement industry expanded its production and storage and handling facilities in 1956 to meet the growing demands of State industrial and highway construction. Output increased 4 percent to 26 million barrels in 1956; this was 91 percent of the installed capacity. All Texas cement plants were in or near large urban and industrial centers. Cement plants inland used limestone as the basic raw material; plants bordering the Gulf coast used shell because its bulk weight and relatively low unit value restricted the shipping distances to the proximity of the consuming markets. Intrastate markets consumed nearly 77 percent of the cement shipped in 1956; shipments to adjoining States made up the remainder.

There were 13 cement plants in Texas in 1956. One newcomer, Texas Portland Cement Co., built a $6-million, 540,000-barrel-annual-capacity plant at Orange. Initial production is expected in early 1957. Nine cement plants and 70 percent of the State capacity were in 6 inland counties; 4 plants, with 30 percent of the total cement capacity, were in two Gulf coast counties. Industry expansions occurring in 1956 are reported in the Review by Counties.

**TABLE 15.—Portland cement produced and shipped, 1947–51 (average) and 1952–56**

(376-pound barrels)

| Year | Production (barrels) | Shipments | | |
|---|---|---|---|---|
| | | Barrels | Value | |
| | | | Total | Average per barrel |
| 1947–51 (average) | 15,279,207 | 15,160,409 | $34,040,098 | $2.25 |
| 1952 | 19,997,983 | 19,849,455 | 48,042,901 | 2.42 |
| 1953 | 19,253,677 | 19,140,193 | 48,497,762 | 2.53 |
| 1954 | 21,541,325 | 21,928,170 | 56,674,124 | 2.58 |
| 1955 | 24,341,443 | 24,038,427 | 64,820,374 | 2.70 |
| 1956 | 25,654,997 | 25,234,150 | 73,069,953 | 2.90 |

Digitized by Google

**Clays.**—The clay industry of Texas was an important segment of its economy. Although extensive deposits of common clay or shale are widely distributed over the State, only those deposits close to large metropolitan or industrial centers were exploited. Total clays production increased 2 percent compared with 1955; the value declined 7 percent. Miscellaneous or common clay provided 80 percent of the production, 32 percent of which was used in cement. Other important uses included the manufacture of building brick, heavy clay products, and lightweight aggregates. Fire clay was 15 percent of the total clays produced, and bentonite and fuller's earth made up the remainder. The bulk of the fire clay was used in heavy clay products, and smaller amounts were consumed in refractories, pottery, and stoneware. Bentonitic clays were used principally as a filtering medium for mineral and vegetable oils, as a component of drilling muds, and as an absorbent for insecticides.

Clays production was reported from 41 counties by 77 producers; 30 of these counties reported miscellaneous clay, 11 fire clay, 4 bentonite, and 2 fuller's earth. The five principal clay-producing counties, in the order of their output, were: Harris, Dallas, Eastland, Bastrop, and Bexar. The five leading producing companies were: Acme Brick Co., Texas Lightweight Aggregate Co., Featherlite Corp., American Aggregate Co., and Henderson Clay Products Co. Industry notes on expansions are reported in the County Review section.

**TABLE 16.—Clays sold and used by producers, 1947–51 (average) and 1952–56, by kinds**

| Year | Bentonite | | Fire clay | | Fuller's earth | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 27,830 | $252,924 | 270,338 | $614,840 | 110,139 | $1,390,140 |
| 1952 | 31,386 | 584,938 | 358,466 | 1,064,005 | 105,565 | 1,030,005 |
| 1953 | 47,887 | 670,300 | 356,211 | 915,575 | 106,437 | 1,277,670 |
| 1954 | 105,744 | 1,299,380 | 347,247 | 2,187,866 | 62,788 | 590,135 |
| 1955 | 155,128 | 1,461,873 | 437,595 | 1,068,664 | (1) | (1) |
| 1956 | 160,723 | 1,182,620 | 483,417 | 1,007,188 | (1) | (1) |

| Year | Miscellaneous clay | | Total | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 1,423,261 | $1,446,638 | 1,831,568 | $3,704,542 |
| 1952 | 1,573,603 | 1,791,234 | 2,069,020 | 4,470,182 |
| 1953 | 1,860,440 | 1,815,429 | 2,370,975 | 4,678,974 |
| 1954 | 1,885,145 | 2,924,643 | 2,400,924 | 7,002,024 |
| 1955 | 2,504,236 | 2,569,385 | [2] 3,096,959 | [2] 5,099,922 |
| 1956 | 2,602,061 | 2,575,260 | [2] 3,146,201 | [2] 4,765,068 |

[1] Figures withheld to avoid disclosing individual company confidential data.
[2] Incomplete total; excludes fuller's earth.

**Feldspar.**—The 1956 production of crude feldspar was greater than that of 1955. Production originated in three counties: Burnet, Gillespie, and Llano. The bulk of the material was ground and processed as a roofing material.

**Fluorspar.**—Fluorspar, imported principally from Mexico, was processed at several Texas mills for the metallurgical and chemical indus-

Digitized by Google

tries. Reynolds Metals Co. completed a mill at Eagle Pass to process Mexican ores for use in synthetic cryolite. The Reynolds Metals Co. used cryolite at its aluminum-reduction works in Alabama, Arkansas, Oregon, and Washington. Other fluorspar mills were at Houston in Harris County, at Flatonia in Fayette County, and at Marathon in Brewster County.

**Gem Stones.**—Collection, barter, preparation, and sale of gem stones by amateurs, hobbyists, and dealers continued to increase in 1956. The principal gem-type minerals found in Texas were: Agate, jasper, amethyst, apatite, chrysocolla, cinnabar, fluorite, garnet, obsidian, and opal. Search for these stones centered in Brewster, Culberson, Hudspeth, Jeff Davis, Mason, Webb, and Zapata Counties.

**Graphite.**—Graphite was mined from open pits in Burnet County in 1956.

**Gypsum.**—Gypsum mining in Texas in 1956 declined in both volume and value from the record high of 1955, even though building construction within the State remained at boom proportions. Production was reported from four counties—Fisher, Hardeman, Hudspeth, and Nolan. The bulk of the output was used in lath and wallboard; the remainder was used for building plaster. The Acme plant and quarry of Certain-Teed Products Corp. was sold during the year to Bestwall Gypsum Co. of Ardmore, Pa.

**TABLE 17.—Gypsum mined, 1947–51 (average) and 1952–56**

| Year | Crude gypsum mined | | | Year | Crude gypsum mined | | |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | | | Short tons | Value | |
| | | Total | Average per ton | | | Total | Average per ton |
| 1947–51 (average) | 956,341 | $2,416,430 | $2.53 | 1954 | 1,218,048 | $3,773,230 | $3.10 |
| 1952 | 1,021,161 | 2,682,019 | 2.63 | 1955 | 1,349,434 | 4,219,652 | 3.13 |
| 1953 | 1,067,854 | 2,860,633 | 2.68 | 1956 | 1,156,956 | 3,623,005 | 3.13 |

**Lime.**—Moderate expansion of the lime industry of Texas continued in 1956, as demand for building plaster and for chemical and industrial uses remained at high levels. Consumption by chemical and industrial users amounted to 92 percent of the total output in 1956 compared with 93 percent in 1955. Building plasters consumed most of the remainder. Lime production was reported from 7 counties by 9 producers; the 3 leading counties in the order of output being Comal, Nueces, and Harris. Limestone, as the basic raw material, was used for 56 percent of the production and shell was used in 44 percent. The bulk of the lime output (83 percent) was consumed within the State, and the major part of this production went to captive use. Most out-of-State shipments were sent to adjoining States.

The industry had 23 shaft kilns and 8 rotary kilns, with an annual capacity approximating 660,000 tons operating in 1956. Most kilns were fired by natural gas; the rest used byproduct coke as a fuel. The El Paso Building Materials Co. stopped operating its limestone

Digitized by Google

quarry because of mounting costs and foreign competition. Principal chemical and industrial uses were in the manufacture of lithium hydroxide, paper, and petrochemicals, as metallurgical lime for open hearth and electric furnaces, for water purification and softening, for sewage treatment, and in petroleum refining. One new use for lime in Texas was in producing lithium hydroxide.

**TABLE 18.—Lime (quick and hydrated) sold by producers, 1947–51 (average) and 1952–56**

| Year | Quicklime (short tons) | Hydrated lime (short tons) | Total | |
|---|---|---|---|---|
| | | | Short tons | Value |
| 1947–51 (average) | 140,565 | 54,113 | 194,678 | $1,840,752 |
| 1952 | 209,904 | 71,700 | 281,604 | 2,622,975 |
| 1953 | 256,000 | 219,569 | 475,569 | 4,380,831 |
| 1954 | 306,433 | 241,003 | 547,436 | 5,421,732 |
| 1955 | 307,322 | 277,533 | 584,855 | 5,519,309 |
| 1956 | 349,693 | 242,443 | 592,136 | 6,937,951 |

**Lithium.**—Lithium hydroxide was prepared at the San Antonio plant of American Lithium Chemicals, Inc. Lepidolite ores of Southern Rhodesia were the principal raw material of the plant.

**Magnesium Compounds.**—Magnesium compounds, as well as industrial chemicals, were produced at the Freeport plant of Dow Chemical Co. A $45-million expansion program, started at the Freeport works in 1956, included new plants to produce ethanolamines, synthetic glycerol, and acetylene; new pilot plants and laboratories; a 29-mile gas pipeline; and expansions or replacements to existing plants. Operations at both the Freeport and Velasco plants were halted by a labor strike during July and early August.

**Natural Salines.**—Sodium sulfate was recovered from well and dry-lake brines near Monahans in Ward County, Tex., in 1956.

**Perlite (Expanded).**—Although no crude perlite was produced in Texas in 1956, crude material from New Mexico and Colorado was expanded at 5 plants in 3 counties. The bulk of the expanded material was used as a lightweight aggregate in concrete for roof decks and as an aggregate in building plaster. All plants were located close to markets in or nearby large metropolitan and industrial areas.

**Pumicite (Volcanic Ash).**—Pumicite was produced from open pits in two counties in Texas in 1956. Principal uses were as a filler in floor tile, as an insulating medium, as an absorbent for oils and greases, and for acoustic plaster.

**Salt.**—Salt derived from the vast salt domes of the Gulf Coast and Coastal Plains, was a vital ingredient of the growing chemical industry. Production increased 11 percent compared with 1955. Over 90 percent of the production was brine from wells drilled to subsurface salt domes in 7 counties, the 3 principal producing counties being Brazoria, Duval, and Chambers. The bulk of the brine was used in chlorine and soda ash; other uses included paper and pulp manufacture, feed mixing, water softening, and the manufacture of other chemicals. Most of the salt was consumed within the State.

Digitized by Google

**TABLE 19.—Salt sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | | Year | Short tons | Value | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Total | Average per ton |
| 1947–51 (average) | 1,688,020 | $2,613,824 | $1.55 | 1954 | 2,864,312 | $9,310,339 | $3.25 |
| 1952 | 2,640,209 | 4,402,032 | 1.67 | 1955 | 3,583,242 | 12,867,094 | 3.59 |
| 1953 | 2,845,190 | 5,010,624 | 1.76 | 1956 | 3,962,778 | 14,369,558 | 3.63 |

**Sand and Gravel.**—The 1956 output and value of sand and gravel in Texas declined 7 and 4 percent, respectively compared with 1955, despite near-record activities of the State building and highway construction programs. Deposits of this material, extensive and widespread over most of Texas, are found most often along or adjacent to the larger streams. This widespread occurrence proved particularly beneficial to the State construction industry, because hauling distances limit the availability to this bulky and low-unit value commodity.

Production was reported from 101 of the 254 Texas counties, with commercial production supplying approximately 80 percent of the output and Government-and-contractor production the remaining 20 percent. Building and paving uses consumed 91 percent of the output; concrete aggregate 3 percent. Other uses were for manufacturing glass, for railroad ballast, engine, and molding sands, and for sand blasting, filtering, and grinding. Seventy-eight percent of all the sand and gravel produced was washed or otherwise prepared. Trucks handled 58 percent of the shipments; railroads 35 percent; and waterways 3 percent.

The average value of commercial sand and gravel in 1956 was $1.09 a ton; prepared material averaged $1.14 a ton, and pit-run material averaged 56 cents per ton. In 1955 prepared material averaged $1.11 per ton and pit-run material 55 cents per ton. The bulk of the Government-and-contractor material was produced for the Texas Highway Department.

**TABLE 20.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Commercial | | Government-and-contractor | | Total sand and gravel | | |
|---|---|---|---|---|---|---|---|
| | | | | | Short tons | Value | |
| | Short tons | Value | Short tons | Value | | Total | Average per ton |
| 1947–51 (average) | 13,795,877 | $13,135,979 | 2,163,053 | $499,752 | 15,958,930 | $13,635,731 | $0.85 |
| 1952 | 15,998,314 | 16,662,593 | 2,663,089 | 672,662 | 18,661,403 | 17,275,255 | .93 |
| 1953 | 11,896,963 | 12,426,922 | 3,234,263 | 418,639 | 15,101,226 | 12,845,561 | .85 |
| 1954 | 23,136,286 | 23,892,530 | 3,179,349 | 948,281 | 26,315,635 | 24,840,811 | .94 |
| 1955 | 24,973,270 | 26,303,453 | 6,544,853 | 2,176,897 | 31,518,123 | 28,480,350 | .90 |
| 1956 | 23,311,118 | 25,511,901 | 6,024,579 | 1,700,653 | 29,335,697 | 27,212,554 | .93 |

Digitized by Google

**TABLE 21.—Sand and gravel produced in 1956, by uses**

| Use | Short tons | Value | |
|---|---|---|---|
| | | Total | Average per ton |
| **Sand:** | | | |
| Engine sand | 16,146 | $12,406 | $0.77 |
| Glass sand | 217,267 | 533,501 | 2.46 |
| Molding sand | 88,249 | 147,286 | 1.67 |
| Paving sand | 4,577,962 | 3,135,190 | .68 |
| Railroad-ballast sand | 73,140 | 25,514 | .35 |
| Structural sand | 5,404,531 | 5,065,266 | .94 |
| Other sand | 982,083 | 776,460 | .79 |
| Value of items that cannot be disclosed [1] | 146,896 | 914,125 | 6.22 |
| **Total** | 11,506,274 | 10,609,748 | .92 |
| **Gravel:** | | | |
| Paving gravel | 11,070,016 | 8,442,282 | 0.76 |
| Railroad-ballast gravel | 214,409 | 165,057 | .77 |
| Structural gravel | 5,638,511 | 6,991,103 | 1.24 |
| Other gravel | 906,487 | 1,004,364 | 1.11 |
| **Total** | 17,829,423 | 16,602,806 | .93 |

[1] Includes blast sand and filter sand.

**Stone.**—The Texas stone industry expanded its production, storage, and handling facilities in 1956 to meet the mounting needs of the building- and highway-construction industries and of the cement industry. Output of stone, which included limestone and shell used for cement and lime, increased 20 percent to 32.8 million tons, and value increased 8 percent to $36.3 million. There were 7 kinds of stone: Basalt, caliche, granite, marble, limestone (shell excluded), rhyolite, and sandstone, produced in 68 counties. The five leading stone-producing counties, in order of output, were: Bexar, Wise, Dallas, El Paso, and Comal. The three leading counties producing shell were Chambers, Harris, and Nueces.

**TABLE 22.—Stone sold or used by producers, 1952–56**

| Year | Limestone | | Sandstone | | Oystershell | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1952 | 5,343,324 | $6,634,047 | 879,561 | $667,671 | (1) | (1) |
| 1953 | 6,251,667 | 6,404,938 | (2) | (2) | (1) | (1) |
| 1954 | 13,482,633 | 14,385,288 | (2) | (2) | 10,314,050 | $12,193,316 |
| 1955 | 14,102,882 | 16,080,861 | (2) | (2) | 11,084,797 | 14,763,238 |
| 1956 | 18,706,005 | 18,357,047 | 1,286,476 | 1,244,414 | 12,017,878 | 15,483,005 |

| Year | Miscellaneous | | Total stone | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| 1952 | 1,265,484 | $739,670 | [3] 7,604,468 | [3] $8,664,633 |
| 1953 | 2,022,271 | 1,090,319 | [4] 9,095,109 | [4] 8,550,320 |
| 1954 | 1,297,563 | 1,111,646 | [5] 25,840,338 | [5] 29,343,684 |
| 1955 | 724,216 | 699,916 | 27,321,444 | 33,543,782 |
| 1956 | 700,490 | 635,887 | [6] 32,772,827 | [6] 36,349,747 |

[1] Data not available.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Includes 116,099 tons of granite, marble, and basalt valued at $623,245.
[4] Includes granite and marble.
[5] Excludes certain stone; Bureau of Mines not at liberty to publish.
[6] Includes 61,978 tons of basalt, granite, and marble valued at $629,394.

Digitized by Google

Stone accounted for 63 percent of the output and shell the remaining 37 percent. Limestone composed 90 percent of the stone output, and sandstone 6 percent; the remaining 4 percent was distributed among basalt, granite, marble, caliche, and rhyolite. Crushed stone represented 99 percent of the stone total production; crushed limestone was responsible for 90 percent of the total. The principal uses for crushed stone in 1956 were for road stone and concrete, for railroad ballast, and for cement and lime. Shell dredged from shallow bays along the Gulf coast of Texas and Louisiana totaled 12 million tons in 1956. Principal uses were in cement and lime, for concrete, and for chemicals.

**Sulfur.**—The year 1956 saw the sulfur industry of Texas continue its concerted effort to improve its reserve position as production reached a record. Output of native sulfur by the Frasch process was reported from 5 Gulf coast and Coastal Plain counties by 5 producers. Production of byproduct sulfur from the purification of natural and refinery gases was reported from 9 inland counties by 12 producers. Output of native sulfur (more than 96 percent of the total sulfur produced in the State in 1956) increased 9 percent to 4 million long tons. Shipments, however, declined nearly 9 percent to 3.4 million long tons. The domestic price of sulfur was lowered during the year to meet a similar price cut in foreign sulfur. This price cut caused a 13-percent reduction in the 1956 value. Texas Gulf Sulphur Co., the Nation's largest producer, was building a Frasch plant and developing a sulfur deposit at Fannett dome in Jefferson County. Special industry interest centered in tideland leases off Jefferson County, with active exploration anticipated during the ensuing year.

Principal nonacid uses of sulfur were in wood pulp, carbon bisulfide, dyes, and other chemicals. Principal uses for sulfuric acid were in fertilizers, chemicals, and organic pigments, in refining petroleum, and in the production of iron and steel.

**TABLE 23.—Sulfur produced and shipped from Frasch mines, 1947–51 (average) and 1952–56**

| Year | Production (long tons) | Shipments | | |
|---|---|---|---|---|
| | | Long tons | Value | |
| | | | Total | Average per ton |
| 1947–51 (average) | 3,791,142 | 3,940,238 | $74,084,052 | $18.80 |
| 1952 | 3,784,595 | 3,691,724 | 78,910,000 | 21.37 |
| 1953 | 3,514,771 | 3,614,838 | 97,601,000 | 27.00 |
| 1954 | 3,505,087 | 3,474,477 | 92,791,821 | 26.71 |
| 1955 | 3,657,717 | 3,766,882 | 105,128,170 | 27.91 |
| 1956 | 3,994,393 | 3,437,061 | 91,026,388 | 26.48 |

**Talc and Soapstone.**—Talc and soapstone were produced in two counties in 1956. Output was somewhat greater than that of 1955.

**Vermiculite (Exfoliated).**—Vermiculite shipped in from other States was expanded by 4 plants in 3 counties. Principal uses of the exfoliated material were as a lightweight aggregate for plaster and concrete and as an insulative material.

Digitized by Google

**Water.**—Water was a major factor in the continued industrial growth of Texas and the Southwest; ability to meet this rising demand controls much of the industrial future of Texas. Before World War II, surface and underground water supplies were adequate for industrial, municipal, and irrigation requirements. In the face of burgeoning water requirements of the growing Texas economy and population, as well as impeding of the replenishment of reservoirs by a 4-year drought, existing water supplies over most of Texas appeared scarcely adequate. Fortunately, the north, east, and Gulf coast regions of Texas have surface water from rivers and lakes as a major source of supply; the west, southwest, and Panhandle regions, on the other hand, have no lakes or rivers of sufficient size, except the Canadian River, to bolster their underground water supply.

The ground-water level in these regions had dropped dangerously as irrigation projects increased, as waterflood projects of the oil industry rose, and as population growth and industry expansion mounted. State and Federal agencies were attempting to resolve part of this mounting problem of critical urban and industrial areas by constructing additional dams across the larger streams or by drawing upon reservoirs for lesser demands. One such solution—the Ferrells Bridge Dam and Reservoir in Morris County—will supply industrial and municipal water for the northeast Texas counties in the Daingerfield area. These solutions are only temporary at best, as current demand trends indicate that in the near future water requirements will transcend all available water supplies in critical areas.

## REVIEW BY COUNTIES

**Anderson.**—Minerals produced in Anderson County included crude oil, natural gas, and natural-gas liquids valued at $17.8 million. The Permian Basin Pipeline Co. enlarged its Perchett field plant from 25 to 80 million cubic feet of gas per day. There were 4.3 million barrels of crude oil produced from 22 fields; 1 field produced more than 1 million barrels of crude and 51.2 billion cubic feet of natural gas in 1956. Fifty-nine exploratory wells, totaling 341,255 feet of drilling, resulted in 7 oil discoveries, 1 new oil pay, and 1 new gas pay. Natural-gas liquids were recovered at the Cayuga, Long Lake, and Royall-Cove cycling plants of Tidewater Associated Oil Co. and at the Ware plant of Sylvan S. Price.

Clay-Burn Tile Co. added two kilns and enlarged the storage area at its Palestine tile plant.

**Andrews.**—Andrews County, with a total mineral value of $192.4 million, had the second largest mineral value in the State in 1956. Natural-gas liquids were recovered at the Andrews and Fullerton gasoline plants of Phillips Petroleum Co., the Dollarhide plant of Pure Oil Co., and the South Fullerton, Midland, and the Three Bar plants of Stanolind Oil & Gas Co. El Paso Natural Gas Co. built 65 miles of gathering pipelines and a natural-gasoline plant to process 20 million cubic feet of gas per day. A $7 million building project at the Andrews plant of Phillips Petroleum Co. included a gas-absorption plant, booster station, gathering lines, and a sulfur plant. The sulfur plant will produce 600 long tons of sulfuric acid per day for use in the company's fertilizer plants.

Digitized by Google

**TABLE 24.—Value of mineral production in Texas, 1955–56, by counties[1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Anderson | $16,646,924 | $17,819,500 | Petroleum, natural gas, natural-gas liquids. |
| Andrews | 156,800,567 | 192,356,826 | Petroleum, natural gas, natural-gas liquids, recovered sulfur, stone. |
| Angelina | 397,589 | 422,714 | Clays, petroleum. |
| Aransas | 11,498,065 | 10,641,237 | Petroleum, natural gas, shell. |
| Archer | 26,000,945 | 28,255,650 | Petroleum, natural gas, natural-gas liquids. |
| Atascosa | 18,189,867 | 22,514,377 | Petroleum, natural-gas liquids, sand and gravel, natural gas. |
| Austin | 7,905,645 | 8,535,293 | Petroleum, natural gas, sand and gravel. |
| Bastrop | 849,207 | 1,189,320 | Petroleum, clays, natural gas. |
| Baylor | 3,718,265 | 4,843,850 | Petroleum, natural gas. |
| Bee | 22,220,902 | 24,390,430 | Natural-gas liquids, petroleum, natural gas, stone. |
| Bell | 690,849 | 439,850 | Sand and gravel, stone. |
| Bexar | 14,851,845 | 15,483,997 | Cement, petroleum, stone, sand and gravel, clays, natural gas. |
| Blanco | ---- | 65,527 | Stone, sand and gravel. |
| Borden | 18,700,086 | 25,369,850 | Petroleum, natural gas. |
| Bosque | 18,400 | 19,429 | Sand and gravel. |
| Bowie | 321,308 | 463,194 | Sand and gravel, petroleum, natural gas. |
| Brazoria | 212,432,604 | 224,773,958 | Petroleum, natural-gas liquids, natural gas, magnesium chloride, bromine, Frasch sulfur, salt, magnesium compounds, sand and gravel. |
| Brazos | 20,720 | 22,300 | Natural gas. |
| Brewster | 217,178 | 205,350 | Mercury, clays, gem stones. |
| Briscoe | 179,935 | 44,552 | Clays, stone. |
| Brooks | 17,289,453 | 20,385,150 | Petroleum, natural gas, natural-gas liquids. |
| Brown | 2,243,821 | 2,346,988 | Petroleum, stone, natural gas, sand and gravel, clays. |
| Burleson | 4,738 | 15,200 | Petroleum. |
| Burnet | 1,405,314 | 1,662,374 | Stone, graphite, sand and gravel, feldspar. |
| Caldwell | 8,599,443 | 9,131,250 | Petroleum, natural gas. |
| Calhoun | 11,792,721 | 14,019,757 | Petroleum, natural gas, natural-gas liquids, shell, stone. |
| Callahan | 9,172,876 | 11,289,450 | Petroleum, natural gas. |
| Camp | 793,104 | 651,750 | Do. |
| Carson | 20,534,245 | 22,564,092 | Natural gas, petroleum, sand and gravel, natural-gas liquids. |
| Cass | 3,460,155 | 6,797,595 | Petroleum, natural-gas liquids, natural gas, iron ore. |
| Chambers | 65,332,364 | 71,235,101 | Petroleum, natural gas, natural-gas liquids, shell, brine, stone. |
| Cherokee | 6,407,493 | 8,326,503 | Petroleum, iron ore, clays, natural gas. |
| Childress | ---- | 11,847 | Sand and gravel. |
| Clay | 18,543,119 | 18,801,850 | Petroleum, natural gas, natural-gas liquids. |
| Cochran | 23,784,397 | 22,096,050 | Do. |
| Coke | 50,243,984 | 43,335,400 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Coleman | 10,934,664 | 10,069,006 | Petroleum, natural gas, sand and gravel, clays, natural-gas liquids. |
| Collin | 90,581 | 112,970 | Stone. |
| Collingsworth | 157,613 | 177,550 | Natural gas, sand and gravel, petroleum. |
| Colorado | 23,476,410 | 25,970,043 | Natural-gas liquids, natural gas, sand and gravel, petroleum. |
| Comal | 2,807,084 | 2,729,254 | Lime, stone, sand and gravel. |
| Comanche | 470,383 | 393,250 | Petroleum, natural gas. |
| Concho | 74,922 | 89,250 | Do. |
| Cooke | 23,865,255 | 24,602,750 | Petroleum, natural-gas liquids, natural gas, stone. |
| Coryell | 122,334 | 161,920 | Stone. |
| Cottle | 42,866 | 103,915 | Sand and gravel, petroleum, stone. |
| Crane | 67,178,247 | 83,385,814 | Petroleum, natural gas, recovered sulfur, natural-gas liquids, stone. |
| Crockett | 26,407,583 | 27,869,350 | Petroleum, natural gas, natural-gas liquids. |
| Crosby | 629 | 119,700 | Petroleum. |
| Culberson | 61,690 | 15,834 | Sand and gravel, natural gas, petroleum. |
| Dallas | 21,158,769 | 20,070,883 | Cement, sand and gravel, clays, stone. |
| Dawson | 9,048,960 | 10,616,346 | Petroleum. |
| Denton | 1,243,348 | 898,393 | Petroleum, sand and gravel, clays. |
| De Witt | 12,797,666 | 12,409,797 | Petroleum, natural-gas liquids, natural gas, stone. |
| Dickens | 93,755 | 72,096 | Petroleum, sand and gravel, pumicite, natural gas. |
| Dimmit | 422,858 | 913,100 | Petroleum. |
| Donley | 178,376 | 3,953 | Sand and gravel. |
| Duval | 42,100,186 | 41,177,767 | Petroleum, natural gas, natural-gas liquids, salt. |
| Eastland | 3,667,177 | 3,420,290 | Petroleum, natural gas, clays, natural-gas liquids, sand and gravel. |
| Ector | 164,919,047 | 178,638,240 | Petroleum, natural gas, natural-gas liquids, recovered sulfur, stone. |
| Edwards | 2,940 | ---- | |
| Ellis | 175,008 | 163,059 | Clays, stone, petroleum. |

**See footnotes at end of table.**

Digitized by Google

**TABLE 24.—Value of mineral production in Texas, 1955–56, by counties [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| El Paso | $6,526,308 | $6,746,982 | Cement, stone, sand and gravel, lime, clays, gem stones. |
| Erath | 148,309 | 150,950 | Petroleum, natural gas. |
| Falls | 67,858 | 86,272 | Stone, petroleum, sand and gravel. |
| Fannin | 27,260 | ---- | |
| Fayette | 2,094,204 | 2,134,662 | Petroleum, clays, sand and gravel, stone. |
| Fisher | 17,177,319 | 18,638,608 | Petroleum, gypsum, natural gas, natural-gas liquids. |
| Floyd | 38,893 | 41,550 | Petroleum, sand and gravel, natural gas. |
| Foard | 355,972 | 843,750 | Do. |
| Fort Bend | 48,696,901 | 47,589,750 | Petroleum, sulfur, natural gas, salt, clays, sand and gravel. |
| Franklin | 14,004,164 | 12,584,050 | Petroleum, natural gas. |
| Freestone | 1,693,738 | 1,774,622 | Natural gas, petroleum, clays, stone, sand and gravel. |
| Frio | 10,607,104 | 8,789,650 | Petroleum, natural gas. |
| Gaines | 64,451,846 | 72,801,822 | Petroleum, natural gas, natural-gas liquids, recovered sulfur. |
| Galveston | 34,899,126 | 30,813,818 | Petroleum, natural gas, sand and gravel. |
| Garza | 14,741,965 | 16,136,150 | Petroleum, sand and gravel, natural gas. |
| Gillespie | 70,093 | 74,778 | Stone, soapstone, feldspar. |
| Glasscock | 14,898,398 | 13,983,424 | Petroleum, natural gas, sand and gravel. |
| Goliad | 11,412,699 | 12,225,850 | Petroleum, natural gas. |
| Gonzales | 266,922 | 236,680 | Petroleum, sand and gravel. |
| Gray | 47,901,490 | 52,412,056 | Petroleum, natural gas, sand and gravel, natural-gas liquids. |
| Grayson | 27,819,337 | 32,251,050 | Petroleum, natural gas, sand and gravel. |
| Gregg | 150,706,676 | 147,798,950 | Petroleum, natural gas, natural-gas liquids. |
| Grimes | 99,152 | 99,550 | Natural gas, petroleum. |
| Guadalupe | 12,212,863 | 12,650,000 | Petroleum, clays, natural gas. |
| Hale | 7,214,690 | 7,246,537 | Petroleum, natural gas, sand and gravel. |
| Hall | 2,200 | ---- | |
| Hamilton | 143,133 | 290,041 | Natural gas, sand and gravel, petroleum. |
| Hansford | 2,549,814 | 3,398,950 | Natural gas, petroleum, natural-gas liquids. |
| Hardeman | 816,374 | 826,313 | Gypsum, petroleum. |
| Hardin | 40,286,232 | 36,709,493 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Harris | 119,532,422 | 128,914,728 | Petroleum, cement, natural-gas liquids, natural gas, salt, lime, sulfur, shell, sand and gravel, clays. |
| Harrison | 17,426,803 | 19,550,864 | Natural gas, natural-gas liquids, petroleum, lignite, clays, sand and gravel. |
| Hartley | 2,563,980 | 2,951,100 | Natural gas, petroleum. |
| Haskell | 9,609,570 | 9,561,125 | Petroleum, natural gas, sand and gravel. |
| Hays | 155,000 | 223,005 | Sand and gravel, stone. |
| Hemphill | 20,797 | 18,300 | Petroleum. |
| Henderson | 9,341,985 | 9,471,517 | Petroleum, natural-gas liquids, natural gas, clays. |
| Hidalgo | 8,171,072 | 8,346,120 | Natural gas, natural-gas liquids, petroleum, sand and gravel, clays. |
| Hill | 55,556 | 187,371 | Stone, sand and gravel. |
| Hockley | 48,660,419 | 48,061,755 | Petroleum, natural-gas liquids, natural gas, recovered sulfur. |
| Hood | 10,294 | ---- | |
| Hopkins | 7,939,340 | 8,048,965 | Petroleum, natural-gas liquids, natural gas, clays. |
| Houston | 3,778,007 | 3,749,140 | Petroleum, natural gas, natural-gas liquids, stone. |
| Howard | 43,966,241 | 43,194,022 | Petroleum, sand and gravel, natural gas, natural-gas liquids. |
| Hudspeth | 702,995 | 718,641 | Stone, talc, soapstone, gypsum, sand and gravel. |
| Hunt | 69,629 | 441,300 | Stone, petroleum. |
| Hutchinson | 48,223,566 | 49,685,872 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Irion | 142,223 | 560,300 | Petroleum, natural gas. |
| Jack | 23,193,962 | 20,780,850 | Petroleum, natural gas, natural-gas liquids. |
| Jackson | 45,935,015 | 50,314,270 | Petroleum, natural-gas liquids, natural gas. |
| Jasper | 843,206 | 846,012 | Petroleum, natural gas, stone, clays. |
| Jeff Davis | ---- | 9,930 | Sand and gravel. |
| Jefferson | 50,803,661 | 49,615,550 | Petroleum, natural-gas liquids, Frasch sulfur, natural gas, recovered sulfur, sand and gravel, shell, clays. |
| Jim Hogg | 4,221,292 | 5,412,850 | Petroleum, natural gas. |
| Jim Wells | 53,769,804 | 52,451,700 | Petroleum, natural gas, natural-gas liquids. |
| Johnson | 817,524 | 1,198,087 | Stone, lime, sand and gravel. |
| Jones | 23,536,573 | 20,923,313 | Petroleum, sand and gravel, stone, natural gas, natural-gas liquids. |
| Karnes | 14,210,249 | 15,254,297 | Petroleum, natural-gas liquids, natural gas. |
| Kaufman | 4,189,699 | 4,039,546 | Petroleum, stone, natural gas. |
| Kenedy | 902,524 | 1,260,600 | Petroleum, natural gas, natural-gas liquids. |
| Kent | 21,990,350 | 17,706,100 | Petroleum, natural gas. |

See footnotes at end of table.

Digitized by Google

**TABLE 24.—Value of mineral production in Texas, 1955–56, by counties [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Kimble | $8,229 | $19,067 | Sand and gravel, petroleum. |
| King | 3,486,922 | 3,827,380 | Petroleum, stone, natural gas. |
| Kleberg | 15,606,209 | 17,231,293 | Petroleum, natural-gas liquids, stone, natural gas. |
| Knox | 3,121,266 | 2,882,178 | Petroleum, natural gas, sand and gravel. |
| Lamar | 14,050 | 14,050 | Sand and gravel. |
| Lamb | 622,544 | 1,224,100 | Petroleum, natural gas. |
| Lampasas | 33,750 | 30,000 | Sand and gravel. |
| La Salle | 440,573 | 1,053,200 | Petroleum, natural gas. |
| Lavaca | 19,827,600 | 21,995,100 | Natural-gas liquids, natural gas, petroleum, stone. |
| Lee | 3,596 | 6,400 | Petroleum. |
| Leon | 2,270,290 | 2,247,400 | Natural gas, petroleum. |
| Liberty | 55,437,563 | 53,913,820 | Petroleum, Frasch sulfur, natural gas, natural-gas liquids, sand and gravel, stone. |
| Limestone | 1,752,662 | 1,788,965 | Petroleum, natural gas, stone, sand and gravel. |
| Lipscomb | | 6,200 | Petroleum. |
| Live Oak | 12,176,607 | 14,197,100 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Llano | 80,944 | 84,740 | Stone, feldspar. |
| Loving | 4,891,630 | 4,454,850 | Petroleum, natural gas. |
| Lubbock | 2,179,522 | 2,578,596 | Petroleum, sand and gravel, stone, natural gas. |
| Lynn | 252,145 | 446,700 | Petroleum, natural gas. |
| Madison | 728,657 | 770,350 | Natural gas, petroleum. |
| Marion | 4,802,880 | 5,007,950 | Petroleum, natural gas, natural-gas liquids. |
| Martin | 1,722,597 | 1,832,150 | Petroleum, sand and gravel, natural gas. |
| Mason | | 40 | Gem stones. |
| Matagorda | 36,249,860 | 38,335,280 | Petroleum, natural gas, natural-gas liquids, shell. |
| Maverick | 36,449 | 45,500 | Petroleum, natural gas. |
| McCulloch | 4,054 | 2,800 | Petroleum. |
| McLennan | 3,718,400 | 3,928,571 | Cement, sand and gravel, stone, petroleum. |
| McMullen | 3,679,018 | 3,759,150 | Petroleum, natural gas. |
| Medina | 85,103 | 155,100 | Petroleum, clays. |
| Menard | 494 | | |
| Midland | 52,336,111 | 59,261,733 | Petroleum, natural gas, natural-gas liquids, stone. |
| Milam | 2,934,401 | 3,809,979 | Lignite, petroleum, natural gas, sand and gravel. |
| Mitchell | 5,190,486 | 7,109,748 | Petroleum, sand and gravel, natural gas. |
| Montague | 25,520,805 | 22,702,666 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Montgomery | 43,881,953 | 44,891,266 | Petroleum, natural-gas liquids, natural gas, sand and gravel. |
| Moore | 31,435,256 | 33,365,599 | Natural gas, helium, natural-gas liquids, petroleum, recovered sulfur. |
| Motley | 10,600 | 18,177 | Sand and gravel. |
| Nacogdoches | 1,509,081 | 1,607,650 | Natural gas, clays, petroleum. |
| Navarro | 8,358,816 | 8,179,445 | Petroleum, clays, natural gas, stone, sand and gravel. |
| Newton | 3,430,627 | 3,634,516 | Petroleum, natural gas. |
| Nolan | 27,294,207 | 34,325,968 | Petroleum, cement, gypsum, natural gas, sand and gravel, natural-gas liquids, stone. |
| Nueces | 80,120,762 | 83,124,238 | Petroleum, natural-gas liquids, natural gas, cement, lime, shell, sand and gravel. |
| Ochiltree | 105,030 | 1,047,600 | Petroleum, natural gas. |
| Oldham | 490,452 | 481,639 | Sand and gravel, natural gas. |
| Orange | 16,928,948 | 17,089,610 | Petroleum, natural gas, stone. |
| Palo Pinto | 1,152,062 | 1,085,696 | Petroleum, clays, natural gas, sand and gravel, natural-gas liquids, stone. |
| Panola | 55,562,256 | 61,807,280 | Natural gas, natural-gas liquids, petroleum. |
| Parker | 356,274 | 288,640 | Clays, petroleum, natural-gas liquids, natural gas, stone. |
| Pecos | 51,429,607 | 50,750,713 | Petroleum, natural gas, natural-gas liquids, sand and gravel, stone, gem stones. |
| Polk | 6,414,505 | 6,150,354 | Petroleum, natural gas, stone, sand and gravel. |
| Potter | 6,416,052 | 7,144,812 | Natural gas, helium, sand and gravel, natural-gas liquids, petroleum. |
| Presidio | 65,041 | 59,957 | Mercury, sand and gravel. |
| Rains | | 13,700 | Petroleum. |
| Reagan | 48,147,569 | 51,459,346 | Petroleum, natural-gas liquids, natural gas. |
| Red River | 7,441 | 27,800 | Petroleum. |
| Reeves | 1,504,528 | 1,405,602 | Petroleum, sand and gravel, natural gas, natural-gas liquids. |
| Refugio | 70,378,573 | 72,755,150 | Petroleum, natural gas, natural-gas liquids. |
| Roberts | 4,772,828 | 4,844,650 | Petroleum, natural gas. |
| Robertson | 564,582 | 566,375 | Sand and gravel, petroleum, natural gas. |
| Rockwall | 332,664 | 151,438 | Stone. |
| Runnels | 21,071,577 | 18,673,900 | Petroleum, natural-gas liquids, natural gas. |
| Rusk | 88,760,559 | 85,438,820 | Petroleum, natural gas, natural-gas liquids, clays. |

See footnotes at end of table.

Digitized by Google

**TABLE 24.—Value of mineral production in Texas, 1955–56, by counties [1]—Con.**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| San Jacinto | $2,477,240 | $2,376,243 | Petroleum, natural gas, sand and gravel. |
| San Patricio | 53,375,158 | 52,698,196 | Petroleum, natural gas, natural-gas liquids, sand and gravel, stone. |
| Schleicher | 9,499,146 | 9,992,700 | Petroleum, natural gas. |
| Scurry | 118,265,860 | 129,380,150 | Petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Shackelford | 8,333,299 | 8,376,474 | Petroleum, natural gas, sand and gravel, natural-gas liquids. |
| Shelby | 1,821,079 | 1,961,350 | Natural gas, petroleum. |
| Sherman | 9,952,932 | 10,701,300 | Do. |
| Smith | 5,714,787 | 6,398,125 | Petroleum, natural-gas liquids, natural gas, sand and gravel, clays. |
| Somervell | 6,351 | | |
| Starr | 24,806,075 | 23,790,164 | Petroleum, natural gas, natural-gas liquids, sand and gravel, pumicite, clays. |
| Stephens | 9,146,053 | 10,843,900 | Petroleum, natural gas, natural-gas liquids. |
| Sterling | 2,215,216 | 2,513,750 | Petroleum, natural gas. |
| Stonewall | 27,351,645 | 30,326,314 | Petroleum, natural gas, sand and gravel, natural-gas liquids. |
| Sutton | 420,236 | 445,700 | Natural gas, petroleum. |
| Swisher | | 3,370 | Stone. |
| Tarrant | 8,302,797 | 9,021,857 | Cement, sand and gravel, stone. |
| Taylor | 5,587,017 | 8,294,759 | Petroleum, stone, sand and gravel, clays, natural gas. |
| Terrell | | 5,803 | Stone. |
| Terry | 20,609,212 | 21,824,750 | Petroleum, natural gas. |
| Throckmorton | 10,661,888 | 10,031,100 | Do. |
| Titus | 12,174,184 | 11,761,800 | Do. |
| Tom Green | 5,222,155 | 8,027,311 | Petroleum, sand and gravel, natural gas. |
| Travis | 2,557,187 | 1,348,590 | Stone, lime, sand and gravel, petroleum, abrasives. |
| Trinity | 14,200 | 15,300 | Natural gas. |
| Tyler | 4,058,061 | 4,103,364 | Petroleum, natural-gas liquids, natural gas, stone. |
| Upshur | 9,525,988 | 8,893,750 | Petroleum, natural gas, sand and gravel. |
| Upton | 59,365,727 | 61,264,577 | Petroleum, natural-gas liquids, natural gas, stone. |
| Uvalde | 2,413,212 | 2,547,354 | Asphalt, basalt. |
| Van Zandt | 29,160,347 | 29,552,732 | Petroleum, salt, natural gas, natural-gas liquids. |
| Victoria | 29,807,847 | 29,261,830 | Petroleum, natural gas, sand and gravel. |
| Walker | 218,100 | 242,716 | Clays, petroleum. |
| Waller | 32,243,754 | 36,623,272 | Natural-gas liquids, petroleum, sand and grave , natural gas. |
| Ward | 35,766,344 | 36,928,890 | Petroleum, natural gas, natural salines, natural-gas liquids, sand and gravel, stone. |
| Washington | 903,526 | 852,350 | Petroleum, natural gas. |
| Webb | 6,232,826 | 5,763,532 | Petroleum, sand and gravel, natural gas, clays. |
| Wharton | 94,913,298 | 85,234,191 | Sulfur, petroleum, natural gas, natural-gas liquids, sand and gravel. |
| Wheeler | 4,849,496 | 4,994,520 | Petroleum, natural-gas liquids, stone, natural gas. |
| Wichita | 31,874,269 | 32,460,014 | Petroleum, natural gas, natural-gas liquids, sand and gravel, stone. |
| Wilbarger | 13,918,589 | 16,057,250 | Petroleum, natural-gas liquids, natural gas. |
| Willacy | 8,475,954 | 9,078,450 | Petroleum, natural gas. |
| Williamson | 976,145 | 988,639 | Stone, lime, petroleum, sand and gravel, natural gas. |
| Wilson | 1,488,118 | 2,396,117 | Petroleum, clays, natural gas. |
| Winkler | 48,663,274 | 50,254,413 | Petroleum, natural gas, natural-gas liquids, recovered sulfur. |
| Wise | 4,286,523 | 7,568,232 | Petroleum, stone, natural gas, natural-gas liquids, clays, sand and gravel. |
| Wood | 68,624,818 | 67,089,750 | Petroleum, natural gas, natural-gas liquids. |
| Yoakum | 57,636,817 | 58,310,284 | Petroleum, natural gas, natural-gas liquids, salt. |
| Young | 20,393,474 | 21,740,650 | Petroleum, natural-gas liquids, natural gas. |
| Zapata | 3,115,679 | 3,393,600 | Petroleum, natural gas. |
| Zavala | 89,068 | 124,740 | Natural gas, sand and gravel, petroleum. |
| Undistributed [2] | [3] 7,273,965 | 22,751,526 | Stone, sand and gravel, shell, gem stones, iron ore. Sand and gravel, stone. |
| Total | [3] 3,993,310,000 | 4,211,282,000 | |

[1] The following counties are not listed because no production was reported: Armstrong, Bailey, Bandera, Cameron, Castro, Dallam, Deaf Smith, Delta, Kendall, Kerr, Kinney, Mills, Morris, Parmer, Randall, Real, Sabine, San Augustine, San Saba, and Val Verde.

[2] Includes stone, sand and gravel, shell, gem stones, and iron ore that cannot be assigned to specific counties.

[3] Total value has been adjusted to eliminate duplicating value of clays and stone.

465877—58——69

Digitized by Google

**Angelina.**—Production of 3,000 barrels of crude oil from 1 oilfield was reported in the county during 1956.

Bentonitic clay also was reported.

**Aransas.**—The oil and gas industry recovered 3.3 million barrels of crude oil from 68 oilfields and 16.9 billion cubic feet of natural gas in 1956. Wells completed by the oil and gas industry totaled 21 and resulted in 7 oil wells and 4 gas wells. Exploratory drilling totaled 91,509 feet and resulted in 1 gas discovery, a new oil pay, and 1 new gas pay.

Carbon black was recovered at 2 plants—1 contact and 1 furnace. Shell was dredged from the shallow bays bordering the county.

**Archer.**—Mineral output valued at $28.3 million included 9.9 million barrels of crude oil from 123 oilfields, 2 of which produced more than 1 million barrels each. Natural-gas output amounted to 4.7 billion cubic feet. Natural-gas liquids were recovered at the Holiday gasoline plant of Warren Petroleum Corp. Exploratory drilling, totaling 42 completions and 196,953 feet, proved 6 oil discoveries and 1 new oil pay.

**Atascosa.**—Crude oil, natural gas, natural-gas liquids, and sand and gravel valued at $22.5 million were reported from the county in 1956. During the year 6.5 million barrels of crude oil and 3.7 billion cubic feet of gas were produced from 48 oilfields. The Jourdanton gasoline plant of Humble Oil & Refining Co. processed gas from the Jourdanton field to recover natural-gas liquids.

**Austin.**—Paving sand and gravel was prepared by the Austin County Highway Department and by the District Engineer of Houston.

Three oilfields yielded 2.4 million barrels of crude oil. Natural-gas production amounted to 24.9 billion cubic feet.

**Bastrop.**—Fire clay used in manufacturing building brick and heavy clay products was mined by Elgin Butler Brick Co., Elgin Standard Brick Manufacturing Co., and Payne Brick Co.

Crude-oil output of 265,000 barrels from 10 oilfields was reported during the year. A small quantity of natural gas also was reported.

**Baylor.**—Crude oil and natural gas valued at $4.8 million were reported from Baylor County in 1956. Sixteen oilfields, 1 of which produced approximately 1 million barrels of crude, yielded a total of 1.7 million barrels of crude. Natural-gas output was 21 million cubic feet. Exploratory drilling, totaling 190,046 feet, resulted in 6 oil discoveries.

**Bee.**—Mineral output valued at $24.4 million included crude oil, natural gas, natural-gas liquids, and stone. Natural-gas liquids were recovered at the Burnell and North Pettus cycling plants of Stanolind Oil & Gas Co. and at a cycling plant of Gasoline Production Corp. Crude oil was processed at the Pettus refinery of Danaho Refining Co. The Bee County's 58 producing oilfields yielded 2.5 million barrels of crude oil. Natural-gas production was 53.4 billion cubic feet. Exploratory drilling totaled 213,166 feet and proved 3 oil discoveries, 5 gas discoveries, 4 new oil pays, and 5 new gas pays.

Crushed limestone, used for concrete aggregate and roadstone, was prepared by Heldenfels Bros. from a quarry near Beeville.

**Bell.**—Sand and gravel, used for building and paving and as railroad ballast, was prepared by the Belton Sand & Gravel Co., Inc., and

Digitized by Google

Little River Gravel Co. Crushed limestone, for concrete aggregate and roadstone, was quarried under contract for Division 9 of the Texas Highway Department.

**Bexar.**—Portland and masonry cements were produced at the San Antonio plant of Longhorn Portland Cement Co. and at the Cementville plant of San Antonio Portland Cement Co. Both companies quarried limestone from open pits for manufacturing cement products. Other limestone quarried from open pits was crushed and processed for use as aggregate in concrete, and road stone and railroad ballast by Colglazier Construction Co., by McDonough Bros., Inc., by Olmos use as aggregate in concrete, roadstone and railroad ballast by Colglazier Construction Co., by McDonough Bros., Inc., by Olmos Rock Products Corp., and by Division 15 of the Texas Highway Department. New crushing facilities to provide 300 tons per hour of crushed stone were added to the 3,000-ton per day crushing plant of McDonough Bros., Inc.

Fire clay, used to manufacture building brick and heavy clay products, was mined from open pits by the Alamo Clay Products Co. near Elmendorf and by the Southern Co. near Los Oya. Miscellaneous clay, used to produce lightweight aggregate, was mined from open pits by Barrett Industries of San Antonio and by Featherlite Corp. of San Antonio at Converse.

Sand and gravel, used principally for building and paving, was processed at fixed plants of Acme Gravel Corp., E. G. Beck & Sons, Osborn Sand Co., San Antonio Silica Sand Co., H. B. Zachry Co., and Harris Sand Pit.

Lithium ores from Southern Rhodesia were processed into lithium hydroxide and other lithium chemicals at the new San Antonio plant of American Lithium Chemicals, Inc.

Crude oil was processed at the San Antonio refinery of Monarch Refining Co. The oil industry produced 598,000 barrels of crude oil from 10 oilfields and 1 million cubic feet of natural gas. Forty-one exploratory wells—totaling 55,839 feet—resulted in 10 oil completions and 31 dry holes.

**Blanco.**—Crushed limestone for concrete aggregate and roadstone was produced under contract for Division 14 of the Texas Highway Department. Paving sand and gravel was produced at a portable plant near Johnson City by Weirich Bros.

**Borden.**—The oil and gas industry produced 8.8 million barrels of crude oil from 25 oilfields, 4 of which produced approximately 1 million barrels of crude each, and 9.1 billion cubic feet of natural gas. The combined value was $25.4 million. Exploratory drilling by the oil industry totaled 164,014 feet and resulted in 3 oil completions and 17 dry holes.

**Bowie.**—Two oilfields yielded 20,000 barrels of crude during 1956. Four exploratory wells totaling 17,871 feet; all proved dry.

Sand and gravel for building and paving and for railroad ballast was produced at the fixed plant of Gifford Hill & Co., Inc.

**Brazoria.**—The mineral industries of Brazoria County were first in total value in 1956. Output of 25.9 million barrels of crude oil from 62 oilfields, 5 of which produced more than 1 million barrels each, was reported. Natural-gas production amounted to 500.8 billion cubic feet. Natural-gas liquids were recovered at the Bayou gasoline plant of Phillips Petroleum Co., the Pledger plant of Humble Oil & Refining Co., and the Hastings and Old Ocean plants of Stanolind

Digitized by Google

Oil & Gas Co. Of 151 well completions, 40 were exploratory wells that totaled 387,987 feet and resulted in 2 oil discoveries, 1 gas discovery, 5 new gas pays, and 32 dry holes.

Bromine, used to manufacture ethylene dibromide, was recovered from sea water at the Freeport plant of Ethyl-Dow Chemical Co. The company expanded its ethylene dibromide production capacity 20 percent during 1956.

Magnesium chloride, used to produce magnesium metal and magnesium chemicals, was recovered from sea water at plants in Freeport and Velasco by Dow Chemical Co. Agreement on a 3-year, no-strike contract ended a month-long strike of 4,000 Dow employees, and provided a 5-cent-an-hour across-the-board pay raise added to a 6-percent raise agreed upon earlier. A $45 million expansion program was started at the Freeport works of Dow Chemical Co. in 1956. Facilities included new plants to produce acetylene, methyl-acetylene, ethanolamines and synthetic glycerol; pilot plants, laboratories, and administration building; a 29-mile gas pipeline; and expansions or modernizations of some existing plants. Salt in brine was recovered from wells by Dow Chemical Co. to be used in chemical processes.

Native sulfur was recovered by the Frasch process from the Hoskins mound dome of Freeport Sulphur Co., from Clemens dome of Jefferson Lake Sulphur Co., and from the Damon mound dome of Standard Sulphur Co.

**Brazos.**—During the year 323 million cubic feet of natural gas was produced.

A $1.8 million glass plant to produce 83 tons of single-and double-strength plate glass and crystal glass was under construction at Bryan by the Texas Glass Manufacturing Corp.

**Brewster.**—A carbonaceous shale was mined from open pits south of Alpine for use as a soil conditioner and fertilizer by Manning Minerals Corp. and by Soylaid, Inc.

Exploration for mercury deposits in the famous Terlingua district continued. Lone Star Mercury, Inc., engaged in drilling and development operations in Sections 44 and 57; Terlingua Mercury Corp. continued both surface and underground diamond drilling and underground exploration at its Fresno mine. Terlingua Mercury Corp. also explored its Campo de los Angeles property. Two additional 30-ton rotary furnaces were being installed by Lone Star Mercury, Inc.

Gem stones, mostly opals and various types of agate, were collected in the county by dealers and hobbyists.

**Briscoe.**—Fuller's earth was mined from open pits by the Silverton Clay Products for use in insecticides and fungicides and as an absorbent of mineral oils and greases. Crushed limestone, for concrete aggregate and roadstone, was quarried under contract for Division 25 of the Texas Highway Department.

**Brooks.**—Crude-oil output of 6.3 million barrels from 52 fields was reported in 1956. Natural-gas output amounted to 38.6 billion cubic feet. Carbon black was recovered at one contact-type plant. Exploratory drilling totaled 148,527 feet and proved 2 new oil pays and 4 new gas pays.

**Brown.**—Natural-gas liquids were recovered at the Rising Star gasoline plant of Rudco Oil & Gas Co. Seven oilfields yielded 565,000

Digitized by Google

barrels of crude. Marketed natural gas amounted to 1.6 billion cubic feet.

Ross & Son Construction Co. produced building sand and gravel at a fixed plant near Brownwood. Limestone was quarried and crushed for riprap, concrete aggregate, and railroad ballast by G. C. McBride Co. Clay, used in manufacturing heavy clay products, was produced from open pits by the Texas Brick Co.

**Burnet.**—Gravel for railroad ballast was produced by Texas Crushed Stone Co. Crushed limestone for concrete aggregate, roadstone, and railroad ballast was produced from open pits by Division 14 of the Texas Highway Department and by Houston Clinton Co.

Crushed and dimension granite were quarried in Marble Falls by Texas Granite Corp. for riprap and rough construction and finished architectural stone. Crude feldspar was mined from open pits by Dezendorf Marble Co. The Southwestern Graphite Co. mined graphite from open pits near Burnet. Crude vermiculite was expanded at the Burnet plant of Texas Vermiculite Co.

**Caldwell.**—Fifteen oilfields produced 3.3 million barrels of crude oil. One of these fields produced approximately 1 million barrels. Natural-gas production amounted to 4 million cubic feet.

**Calhoun.**—The Aluminum Company of America began constructing a seventh potline to cost $11 million at its Point Comfort reduction works. The sixth potline was completed earlier in the year. Construction of an alumina plant adjacent to the primary aluminum smelter also was begun during the year. The new plant will produce over 500,000 tons of alumina a year, with initial production anticipated by 1958. A navigation channel from the Gulf of Mexico to the alumina-plant site will permit 25,000-ton ore carriers to haul bauxite from South America directly to the plant. A nine-day labor strike at the Point Comfort plant was terminated with a new 3-year no-strike agreement. The company built an 8-inch, 20,000-foot aluminum gas-transmission line to serve its Point Comfort works.

Crushed sandstone for concrete aggregate and road stone was produced under contract for Division 13 of the Texas Highway Department. Shell was dredged from the shallow bays of Port Lavaca by Smith Bros. Dredging Co.

Natural-gas liquids were recovered by the Heyser gasoline plant of Humble Oil & Refining Co. The oil industry produced 2.4 million barrels of crude oil from 32 fields and 74.6 billion cubic feet of natural gas. Oilfield drilling consisted of 23 exploratory wells and 86 development wells. Exploratory drilling, totaling 194,970 feet, resulted in 1 oil discovery, 2 new oil pays, 1 gas discovery, 2 new gas pays, and 15 dry holes.

**Callahan.**—Mineral fuels valued at $11.3 million were reported in 1956. The oil and gas industry produced 4 million barrels of crude from 77 oilfields, 1 of which produced over 1 million barrels of oil, and 212 million cubic feet of natural gas. Crude oil was processed at the Baird refinery of Premier Oil Refining Co. of Texas.

**Cameron.**—The Port Isabel refinery of Delhi-Taylor Oil Corp. processed crude from oilfields in adjoining counties.

Crude barite, mostly from foreign sources, was ground at the Brownsville plant of Magcobar, Inc. Hidalgo Chemical Co. modernized its gas-synthesis plant at Brownsville. Ultimately the plant will

Digitized by Google

require 90 million cubic feet of natural gas per day to produce such chemicals as alcohols, aldehides, ketones, and acids.

**Camp.**—Three oilfields produced 232,000 barrels of crude during the year. Natural-gas output was 11 million cubic feet. The oil industry drilled 4 exploratory wells totaling 17,019 feet; all proved dry.

**Carson.**—Natural-gas liquids were recovered at the Cargray gasoline plant of the Dorchester Corp., the Bryan No. 17 plant of Shell Oil Co., and the Schafer plant of Skelly Oil Co. A 1,000-barrel-per-day combination catformer and unifying unit to upgrade gasoline was added to the Cargray plant of the Dorchester Corp. Carbon black was recovered at one contact plant in the county. Two oilfields yielded 3.8 million barrels of crude. Natural-gas production was 167.7 billion cubic feet.

District 4 of the Texas Highway Department acquired paving gravel under contract for use in paving and road surfacing.

**Cass.**—Crude-oil and natural-gas production, valued at $5.9 million, consisted of nearly 2 million barrels of crude oil and 5.4 billion cubic feet of natural gas. Natural-gas liquids were recovered at the Lodi gasoline plant of Breckenridge Gasoline Co. Of 54 well completions, 10 were exploratory wells resulting in one oil discovery and 2 new oil pays.

Brown iron ores were mined from open pits near Linden by the S. E. Evans Mining Co., Inc., under contract.

**Chambers.**—Shell was dredged from bays of Chambers County by Horton & Horton, W. D. Haden Co., and Parker Bros. Co. and used principally in manufacturing lime, cement, and industrial chemicals. Salt in brine was obtained from salt domes near Barbers Hill by Diamond Alkali Co. and used in the manufacture of industrial chemicals. Miscellaneous stone, used for concrete aggregate and roadstone, was produced under contract for Division 20 of the Texas Highway Department.

The oil and gas industry produced 17.3 million barrels of crude oil from 42 oilfields, and 91.5 billion cubic feet of natural gas. Natural-gas liquids were recovered at the Anahuac gasoline plant of Humble Oil & Refining Co. Completion of 27 exploratory wells resulted in 1 oil discovery, 1 dual oil-gas discovery, 1 new oil pay, and 3 new gas pays.

**Cherokee.**—Mineral production valued at $8.3 million included 2.6 million barrels of crude oil from 10 oilfields, 243 million cubic feet of natural gas, fire clay, and iron ore. Exploratory drilling, totaling 254,248 feet from 47 completions, resulted in an important gas-pool discovery near Maydelle townsite.

Brown iron ore was mined from open pits near Jacksonville by L. B. Haberle for use by the cement industry and from open pits near Rusk by Sheffield Steel Corp. for its blast furnace at Houston.

Fire clay was mined from open pits near Troup by General Refractories Co.

**Childress.**—Paving gravel was produced under contract for concrete aggregate and roadstone for Division 25 of the Texas Highway Department.

**Clay.**—Production of 6.7 million barrels of crude oil, 316 million cubic feet of natural gas, and natural-gas liquids, with a combined value of $18.8 million, was reported in 1956. There were 92 producing

Digitized by Google

oilfields, with 1 field yielding over 1 million barrels of crude. Natural-gas liquids were recovered at the No. 3 gasoline plant of Graridge Corp. and the Ringgold plant of Otha H. Grimes. There were 298 well completions, 37 exploratory and 261 development wells. Exploratory drilling totaled 203,143 feet, proving 9 oil discoveries and 1 oil extension.

**Cochran.**—Mineral output, valued at $22.1 million, included 7.7 million barrels of crude oil from 9 oilfields, 5.8 billion cubic feet of natural gas, and natural-gas liquids. Natural-gas liquids were recovered at the Lehman gasoline plant of Llano Grande Corp. The oil and gas industry completed 8 exploratory wells, resulting in 1 oil-well completion.

**Coke.**—Production of 13.3 million barrels of crude oil from 37 oilfields, 12.5 billion cubic feet of natural gas, natural-gas liquids, and sand and gravel, with a total value of $43.3 million, was reported in Coke County in 1956. On September 1, 1956, the Railroad Commission of Texas issued a stop-flaring order of casinghead gas, drawn principally from the Jameson (Strawn) field, when the two natural-gasoline plants—the Jameson plant of Sun Oil Co. and the Perkins No. 10 plant of Texas Hydrocarbon Co.—were unable to handle the volume from gathering lines and gasoline plants. The 712 oil wells of the Jameson field produced over 15,300 barrels of crude a day. Exploratory drilling, totaling 212,970 feet from 39 completions, resulted in 3 oil wells and 36 dry holes.

**Coleman.**—Silica sand, used as molding and glass sand in glass manufacture, was produced at a fixed plant near Santa Anna by the Santa Anna Silica Sand Co., Inc. Miscellaneous clay, used in manufacturing heavy clay products, was mined from open pits near Coleman by the Martin Brick Co.

The oil and gas industry produced 3.3 million barrels of crude oil from 97 oilfields, 5.1 billion cubic feet of natural gas, and natural-gas liquids. Natural-gas liquids were recovered at the Coker gasoline plant of Coker Gasoline Co., the Glen Cove plant of Glen Cove Gasoline Plant, the Robertson LPG plant of French M. Robertson, and the Sappington plant of Sappington Gasoline Plant.

Exploratory drilling by the oil and gas industry totaled 147,654 feet from 59 completions, resulting in 12 oil wells and 1 gas well.

**Collin.**—Crushed limestone used for concrete aggregate and roadstone was produced under contract for Division 18 of the Texas Highway Department.

**Collingsworth.**—The oil and gas industry produced 2.1 billion cubic feet of natural gas and 800 barrels of crude.

**Colorado.**—Building and paving sand and gravel were produced from pits near Columbus and Eagle Lake by Horton & Horton, from pits near Columbus by Parker Bros. & Co., Inc., from pits near Alleyton, Altair, and Eagle Lake by Texas Construction Material Co., and from pits near Glidden and Eagle Lake by Thorstenberg & Tamborello.

Mineral production, valued at $25.9 million, included 565,000 barrels of crude oil from 21 oilfields, 86.9 billion cubic feet of natural gas, natural-gas liquids, and sand and gravel. Natural-gas liquids were recovered at the Sheridan cycling plant of Shell Oil Co. and at the Chesterville gasoline plant of Tennessee Gas Transmission Co.

Digitized by Google

Exploratory drilling totaling 93,998 feet resulted in 10 completions, with 1 gas discovery and 1 new gas pay.

**Comal.**—Limestone, quarried and crushed from open pits near New Braunfels, was used in manufacturing lime by the United States Gypsum Co. Limestone, quarried from pits near Ogden and used for railroad ballast, riprap, concrete aggregate, and agricultural lime, was prepared by Servtex Materials Co. Building and paving sand and gravel was prepared by Erhardt Kraft.

**Comanche.**—Production of 721 million cubic feet of natural gas and 120,000 barrels of crude oil was reported by the oil and gas industry. Crude oil was produced from 8 oil fields. Exploratory drilling proved 3 oil wells and 2 gas wells from 12 completions which totaled 32,643 feet.

**Concho.**—The oil and gas industry produced 451 million cubic feet of natural gas and 19,000 barrels of crude oil. Crude was produced from 6 oilfields. The oil and gas industry completed 12 exploratory wells totaling 43,153 feet which proved 2 oil wells.

**Cooke.**—Mineral output valued at $24.6 million included 8.6 million barrels of crude oil from 77 oilfields, with 2 oilfields producing more than 1 million barrels each, 2.5 billion cubic feet of natural gas, and natural-gas liquids. Natural-gas liquids were recovered at the Walnut Bend gasoline plant of Texas Natural Gasoline Corp. and the Sivells Bend gasoline plant of Standard Oil Co. of Texas. Crude oil was processed at the Gainesville refinery of the Tydal Co. Exploratory drilling totaling 181,158 feet proved 3 oil discoveries, 1 new oil pay and 2 extensions.

**Coryell.**—Crushed limestone for concrete aggregate and roadstone was produced by T. E. Sanderford and Division 9 of the Texas Highway Department. Dimension limestone was prepared by the Mid-Tex Stone Co.

**Cottle.**—Crushed limestone for concrete aggregate and roadstone was produced under contract for Division 25 of the Texas Highway Department. Paving sand and gravel was prepared by Childress Sand & Gravel Co.

One oilfield produced 4,000 barrels of crude. The oil industry completed 4 exploratory wells totaling 23,727 feet, all of which proved dry.

**Crane.**—Mineral value totaling $83.4 million was the eighth largest in the State. Production of 28.5 million barrels of crude oil from 74 oilfields, 7 of which produced over 1 million barrels each, and 23.9 billion cubic feet of natural gas was reported.

Sulfur as hydrogen sulfide was recovered from sour gases by the Crane gasoline plant of Phillips Petroleum Co. and the Waddell plant of Gulf Oil Co. These two plants and the Cardona Lake gasoline plant of Houston Hydrocarbon Corp. likewise recovered natural-gas liquids.

Crushed limestone for concrete aggregate and roadstone was prepared under contract for Division 6 of the Texas Highway Department.

**Crockett.**—Mineral fuels valued at $27.9 million were produced in Crockett County in 1956 and included 9.2 milllon barrels of crude oil from 55 oilfields, 19.6 billion cubic feet of natural gas, and natural-gas liquids recovered at the Todd Ranch gasoline plant of Continental

Digitized by Google

Oil Co. Exploratory drilling by the oil and gas industry totaled 158,056 feet for 44 completions, with 5 proving to be oil wells.

**Crosby.**—Two oilfields yielded 43,000 barrels of crude oil for the only mineral production in Crosby County in 1956.

**Culberson.**—The oil and gas industry produced 300 barrels of crude oil from 1 field and 23 million cubic feet of natural gas in 1956.

Paving gravel was produced for the District Engineer of El Paso.

**Dallas.**—Limestone was quarried and crushed for use in the manufacture of cement by Lone Star Cement Corp. and General Portland Cement Co.; while crushed limestone for concrete aggregate and roadstone was prepared under contract for Division 18 of the Texas Highway Department. Portland and masonry cements were produced at the Dallas plant of Lone Star Cement Corp. and at the Nos. 1 and 2 Eagle Ford plants of General Portland Cement Co. The Dallas plant of Lone Star Cement Corp. was being enlarged with the addition of a grinding mill, 2 80-foot rotary kilns, 2 30-foot finishing mills, and accessory facilities including 4 slurry tanks and 3 clinker silos. These additions will increase the plant's capacity by 1.4 million barrels to 3.7 million barrels annually.

Sand and gravel, used principally for building and paving purposes, was produced at 19 plants operated by 14 companies.

Crude perlite shipped in from adjoining States was expanded at the Irving plant of Texas Lightweight Products Co. and at the Dallas plant of Texas Vermiculite Co. The principal use of the expanded material was as lightweight aggregate for concrete, for roof decks, and for building plaster. Miscellaneous clay or shale was used principally for the manufacture of heavy clay products and lightweight aggregate at the Mesquite plant of Ferris Brick Co. and the Dallas plant of the Texas Industries, Inc.

A $1.5 million chemical plant was being built at Dallas for the Shea Chemical Corp. to produce sodium phosphate and phosphoric acids used in the manufacture of industrial cleaners and detergents. The plant will have an annual productive capacity of 60,000 tons and will consume 300 million cubic feet of natural gas. The Southwest Industrial Materials Corp. began constructing a new plant at DeSoto to produce industrial absorbents from common clay.

**Dawson.**—Mineral output valued at $10.6 million consisted of 3.7 million barrels of crude oil from 25 oilfields, with 1 oilfield producing over 1 million barrels, 104 million cubic feet of natural gas, and crushed limestone. Limestone was quarried and crushed from an open pit near O'Donnell for use as concrete aggregate and roadstone by Lone Star Materials, Inc. The oil and gas industry completed 22 exploratory wells for a total of 194,035 feet, resulting in 6 proved oil wells and 16 dry holes.

**Denton.**—Fire clay was mined from open pits near Denton by Acme Brick Co. Building and paving sand and gravel were prepared by Jefferies & Betts Gravel Co., Opitz Sand & Gravel Co., and Trietsch Gravel Co.

Five oilfields yielded 152,000 barrels of crude during the year.

**De Witt.**—The Texas and New Orleans Railroad Co. crushed limestone for rubble. Sandstone was crushed under contract for use as concrete aggregate and roadstone for Division 13 of the Texas Highway Department.

Digitized by Google

Production of 2.9 million barrels of crude oil from 22 oilfields, 24.3 billion cubic feet of natural gas, and natural-gas liquids recovered at the Gohlke gasoline plant of Shell Oil Co. was reported by the oil and gas industry. Exploratory drilling totaled 181,083 feet, proving 1 oil discovery, 3 new oil pays, 1 gas discovery, and 1 new gas pay.

**Dickens.**—Production of 16,000 barrels of crude oil and 5 million cubic feet of natural gas was reported from Dickens County in 1956. Two exploratory wells totaling 12,905 feet were completed as dry holes in 1956.

Pumicite was mined from open pits near McAdoo by the Caprock Chemical Co., Inc.

**Dimmit.**—Twenty-two oilfields yielded 326,000 barrels of crude oil during the year. Crude oil was processed at the Carrizo Springs refinery of Texas Calgary Co. The company completed a 2,000 barrel-per-day products unit at its refinery. Exploratory drilling, totaling 171,875 feet with 54 completions, resulted in proving 12 oil wells, 5 gas wells, and 37 wells were dry holes.

**Donley.**—Paving gravel was produced under contract for Division 25 of the Texas Highway Department.

**Duval.**—Mineral production valued at $41.2 million, including 12 million barrels of crude oil from 123 oilfields (3 of which produced in excess of 1 million barrels each), 46.9 billion cubic feet of natural gas, natural-gas liquids, and salt was reported in 1956. Exploratory drilling totaling 262,023 feet proved 2 oil discoveries, 3 gas discoveries, 3 new oil pays, and 1 new gas pay. Natural-gas liquids were recovered at the Sejita cycling plant of Trinity Gas Corp. and at the Hagist gasoline plant of Goliad Corp.

Salt in brine was recovered from wells near San Diego by Columbia Southern Chemical Corp.

**Eastland.**—Natural-gas liquids were recovered at the Desdemona gasoline plant of Magnolia Petroleum Co., the Graridge No. 2 plant of Graridge Corp., the Pueblo plant of Lone Star Gas Co., and Plant No. 108 of Lone Star Producing Co. The oil and gas industry produced 903,000 barrels of crude oil from 35 oilfields and 8.1 billion cubic feet of natural gas during the year. Exploratory drilling, totaling 78,300 feet, resulted in 12 proved oil wells, 1 proved gas well, and 16 dry holes.

Fire clay and miscellaneous clay used in the manufacture of lightweight aggregate, floor and wall tile, and pottery and flowerpots were mined from open pits near Ranger by American Aggregate Co., near Eastland by Texas Lightweight Aggregate Co., near Cisco by Texeramics Co., and by N. D. Gallagher Clay Products Corp.

Paving and other sand was obtained from pits near Gorman by Hart Bros. Sand & Gravel Co.

**Ector.**—Ector County ranked second among Texas counties in crude-oil output and third in total value of minerals produced in 1956. The oil and gas industry produced 59.6 million barrels of crude oil from 102 oilfields; 15 oilfields producing in excess of 1 million barrels each, 95.7 billion cubic feet of natural gas, natural-gas liquids, carbon black, and sulfur recovered from sour natural gas. Natural-gas liquids were recovered at the Odessa gasoline plant of Odessa Natural Gasoline Co., the Goldsmith and the Judkins plants of Phillips Petroleum Co., the TXL plant of Shell Oil Co., the North Cowden

Digitized by Google

plant of Stanolind Oil & Gas Co., and the Headlee plant of Texas Gulf Producing Co. Sulfur was recovered from sour gas at the Odessa plant of California-Spray Chemical Corp., the Odessa plant of Odessa Natural Gasoline Co., the Penwell plant of J. L. Parker, and the Goldsmith plants of Pan American Petroleum Corp. and of Phillips Chemical Co. The oil and gas industry completed 623 wells in 1956, 41 exploratory wells and 582 development wells. Exploratory drilling totaled 375,412 feet, resulting in 22 proved oil wells and 19 dry holes.

Limestone was quarried and crushed at the Notrees plant of Permian Sand & Gravel Co., Inc., and the new Odessa crushing plant of F. M. Reeves & Sons, Inc. Soapstone was purchased by Southwest Fertilizer & Chemical Co.

A $12 million copolymer plant to blend styrene and butadiene to form a completely integrated synthetic rubber operation was being built at Odessa by General Tire & Rubber Co. A $20 million plant of Odessa Butadiene Co. and $6 million styrene plant of Odessa Styrene Co. completed the three-plant operation. This integrated operation will produce 50,000 tons of synthetic rubber annually. Stanolind Oil & Gas Co. built a sulfur-recovery unit at its North Cowden gasoline plant to extract native sulfur from hydrogen sulfide removed from sour gas.

**Ellis.**—Miscellaneous clay used in manufacturing building brick and heavy clay products was mined from open pits near Ferris by Acme Brick Co., and from pits near Palmer by Barron Brick Co. and near Ferris by Ferris Brick Co. Limestone was quarried and crushed for use in concrete and as roadstone by Division 18 of the Texas Highway Department.

Crude oil totaling 2,000 barrels was produced during the year.

**El Paso.**—Crude oil was processed at the El Paso refineries of the Standard Oil Co. of Texas and of The Texas Co. Standard Oil Co. of Texas began a $20 million expansion program at its El Paso refinery to increase refinery capacity from 36,000 barrels to 61,000 of crude throughput per day. Facilities include a new 25,000-barrel-per-day crude unit, a fluid catalytic cracker, a vacuum flasher, and a polymerization unit.

Crushed limestone used in manufacturing cement and lime was produced by Southwestern Portland Cement Co. and El Paso Building Materials Co. The latter company shut down its quarry because of Mexican competition. Crushed limestone used for concrete aggregate, roadstone, riprap, and railroad ballast was quarried and prepared by A. Courchesne Co., Hugh McMillan, Vowell Material Co., and the Texas Highway Department. Standard Aggregates Co. produced crushed sandstone for riprap, roadstone, and concrete, and dimension sandstone for rubble.

Sand and gravel used for building and paving purposes, as engine sand, and for railroad ballast was produced by three companies: Bowden Sand & Gravel Co., El Paso Sand Products Co., and Standard Aggregates Co.

Portland and masonry cements were produced at the El Paso plant of Southwestern Portland Cement Co. The company completed an expansion program begun in 1955, which included a new grinding mill for the finishing department, a new feed equipment for the mill,

Digitized by Google

and an air-injection system at the bottom of the dry blending silo. Modern truck-loading facilities installed in 1955 became an important factor in the movement of cement to local markets.

American Smelting and Refining Co. operated its lead and copper smelters at near capacity throughout 1956. The company moved its western research section from Salt Lake City, Utah, to new and larger research, mineral-dressing, and assay-control laboratories adjacent to its El Paso smelter.

**Erath.**—The oil and gas industry produced 33,000 barrels of crude oil from 1 field and 729 million cubic feet of natural gas during 1956. Five exploratory wells were completed for a total of 17,031 feet; all wells were dry holes.

**Falls.**—The crude-oil industry produced 7,000 barrels of crude oil from 3 oilfields and completed 1 exploratory well, which proved to be dry.

Division 9 of the Texas Highway Department produced crushed limestone and paving gravel under contract for concrete aggregate and roadstone.

**Fayette.**—Bentonitic clay, used principally in preparing heavy drilling mud for the oil and gas industry, was mined from open pits near Flatonia by Milwhite Co., Inc., and near Muldoon by the Baroid Division of National Lead Co. Fuller's earth was recovered from open pits near Flatonia by Flatonia Fuller's Earth Co. Crushed sandstone for concrete aggregate and roadstone was prepared under contract for Division 13 of the Texas Highway Department. Building and paving sand and gravel were recovered from pits near LaGrange by Thorstenberg & Tamborello.

The oil industry produced 354,000 barrels of crude oil from 15 oilfields. Five exploratory wells were completed for a total of 24,127 feet; all were dry holes.

**Fisher.**—Natural-gas liquids were recovered at the Claytonville gasoline plant of Claytonville Gasoline Co. and at the Velta plant of Texas Pacific Coal & Oil Co. Production of 6.2 million barrels of crude oil from 71 oilfields (with 2 fields producing over 1 million barrels each) and 1.7 billion cubic feet of natural gas was reported. The oil and gas industry completed 58 exploratory wells for a total of 319,978 feet; 17 yielded oil, and 41 were dry holes.

Gypsum was mined from open pits near Longworth by the Celotex Corp. and from pits near Rotan by National Gypsum Co.

**Floyd.**—Building and paving sand was prepared by the Quitaque Sand & Gravel Co.

Production of 8,000 barrels of crude oil from 1 oilfield and 4 million cubic feet of natural gas was reported.

**Foard.**—Paving gravel was produced under contract for Division 25 of the Texas Highway Department.

The oil and gas industry produced 293,000 barrels of crude oil from 7 oilfields and 125 million cubic feet of natural gas in 1956. Oilfield drilling consisted of 11 exploratory wells totaling 60,575 feet. One well was an oil discovery, and 10 wells were dry holes.

**Fort Bend.**—Production of 11.7 million barrels of crude oil from 35 oilfields and 33.6 billion cubic feet of natural gas was reported in 1956. The oil and gas industry completed 43 exploratory wells for a

Digitized by Google

total of 349,383 feet. Six wells were oil wells, 1 was a gas well, and 36 were dry holes.

Native sulfur was recovered from the Orchard dome by Duval Sulphur & Potash Co., from the Nash dome by Freeport Sulphur Co., and from Long Point dome by Jefferson Lake Sulphur Co.

Miscellaneous clay was mined from open pits near Missouri City by Texas Lightweight Aggregate Co. and used in manufacturing lightweight aggregate.

**Franklin.**—Production of 4.5 million barrels of crude oil from 6 oilfields (with 2 fields producing over 1 million barrels each) and of 262 million cubic feet of natural gas was reported in 1956. During the year Tidewater Oil Co. began building a $2 million cycling plant and connecting pipelines from the New Hope gasfield to recover 80 million barrels of condensate. Six exploratory wells totaling 39,496 feet, drilled by the oil and gas industry, proved dry upon completion.

**Freestone.**—Crushed miscellaneous stone for concrete aggregate and roadstone was prepared under contract for Division 10 of the Texas Highway Department. Shale was mined from an open pit near Teague for use in manufacturing heavy clay products by the Teague Brick & Tile Co. Paving gravel was prepared under contract for Division 18 of the Texas Highway Department.

Production of 240,000 barrels of crude oil from 3 oilfields and 12.7 billion cubic feet of natural gas was reported in 1956. The oil and gas industry completed 13 exploratory wells totaling 62,981 feet; 1 was a new gas pay, and 12 wells were dry holes.

**Frio.**—The oil and gas industry produced 3.1 million barrels of crude oil from 11 oilfields and 1.4 billion cubic feet of natural gas during 1956. Of 34 exploratory well completions totaling 140,017 feet, 2 yielded oil, and 32 were dry holes.

**Gaines.**—Gaines County was the 11th-ranking county, with a total mineral output value of $72.8 million. Seventy oilfields produced 25.4 million barrels of crude oil (6 fields produced over 1 million barrels each) and 14.3 billion cubic feet of natural gas. Natural-gas liquids were recovered from two gasoline plants, and sulfur from the purification of sour natural gas. Natural-gas liquids were recovered at the West Seminole gasoline plant of Cities Service Oil Co. and at the Seminole plant of Phillips Petroleum Co.

Sulfur and carbon black were recovered by the Seminole carbon-black plant of Columbian Carbon Co.

**Galveston.**—Crude oil was processed at 4 refineries having a combined daily throughput capacity of 242,000 barrels; 20,000 barrels daily capacity was shut down in 1956. These refineries, all at Texas City, were operated by American Oil Co., Republic Oil Refining Co., Sid Richardson Refining Co., and Texas City Refining, Inc. Republic Oil Refining Co. installed a 20,000-barrel crude distillate unit and a control room for 4 processing units at its Texas City refinery. Texas City Refining, Inc., added a $2 million, 7,000-barrel Houdriformer unit at its refinery. The oil and gas industry produced 10.7 million barrels of crude oil from 39 oilfields, 3 oilfields produced over 1 million barrels each and 10.5 billion cubic feet of natural gas. Exploratory drilling on Tidelands sulfur leases offshore from Galveston disclosed some sulfur deposits. Further exploration was planned in 1957.

Digitized by Google

Paving sand was prepared by the city engineer of Galveston, Tex., and under contract for Division 12 of the Texas Highway Department.

The Texas City tin smelter of Tin Processing Corp. produced 17,631 tons of metal from Bolivia ores. All of the metal was sold to the Government for stockpiling. Sale of the tin smelter was authorized by the Congress, and bids from two prominent mining companies were considered.

**Gazza.**—Production of 5.7 million barrels of crude oil from 24 oilfields and 31 million cubic feet of natural gas was reported by the Texas oil and gas industry in 1956. Of 25 exploratory well completions totaling 126,509 feet, 2 proved to be discovery oil wells, 3 new oil pays, and 20 dry holes.

Building sand was prepared by C. I. Green Sand & Gravel Co.

**Gillespie.**—Building and paving sand and gravel were prepared from pits near Fredericksburg by Alvin Usener and by Weirich Bros. Crude feldspar was mined by Dezendorf Marble Co. Soapstone was mined and prepared at the Llano plant of Southwestern Talc Corp.

**Glasscock.**—Production of 4.1 million barrels of crude oil from 5 oilfields (1 of which yielded over 1 million barrels) and 30.7 billion cubic feet of natural gas was reported by the oil and gas industry in 1956. Five exploratory wells totaling 24,000 feet were drilled during the year; all were dry holes.

**Goliad.**—The oil and gas industry produced 2.8 million barrels of crude oil from 43 oilfields and 55.7 billion cubic feet of natural gas during the year. Of 24 exploration wells totaling 126,845 feet, 1 was an oil discovery, 2 were oil pays, 3 were gas pays, and 18 were dry holes.

**Gonzales.**—Paving sand and gravel was prepared from pits near Gonzales by Gonzales Gravel & Sand Co.

Production of 75,000 barrels of crude oil from 3 oilfields was reported during the year. The oil industry drilled 30 exploratory wells totaling 114,649 feet; all proved dry.

**Gray.**—There were 14.9 million barrels of crude oil from 3 oilfields and 129.8 billion cubic feet of natural gas produced in 1956. Of 373 well completions during 1956, 6 were exploratory and 367 were development wells. Exploration drilling, totaling 64,288 feet, proved 1 gas well; 5 wells were dry holes.

Natural-gas liquids were recovered at the Pampa gasoline plant of Cities Service Oil Co., at 78–1 plant of Coltexo Corp., at No. 6 plant of Kerr-McGee Oil Industries, Inc., and at the Gray, Lefors, North, and Pampa plants of Phillips Petroleum Co. A multi-million-dollar acrylic ester plant was built by Celanese Corp. of America at Pampa, capable of producing 50 million pounds of acrylic esters including methyl-ethyl and butyl acrylates

Carbon black was recovered at 3 contact plants and 1 furnace plant in 1956. Paving gravel was produced under contract for Division 4 of the Texas Highway Department. Molding sand was prepared by W. H. Chitwood.

**Grayson.**—Production of 11.2 million barrels of crude oil from 139 oilfields and 7.2 billion cubic feet of natural gas was reported in 1956. Natural-gas liquids were recovered at the Sherman gasoline plant of Standard Oil Co. of Texas. The oil and gas industry completed 57

Digitized by Google

exploratory wells totaling 377,055 feet, resulting in 8 oil discoveries, 16 new oil pays, and 33 dry holes.

Building and paving sand and gravel were prepared by Wray Wible.

**Gregg.**—Gregg County was the fourth ranking county in total mineral value and third in oil production in 1956. Production of 50.1 million barrels of crude oil from 6 oilfields, 71.5 billion cubic feet of natural gas, and also natural-gas liquids was reported in the county. Crude oil was processed at the Gladewater refinery of Gladewater Refining Co. and at the Longview refineries of Premier Oil & Refining Co. of Texas, and of Skelly Oil Co. Texas Calgary Co. completed a $750,000 expansion program at its Lueders asphalt refinery. Natural-gas liquids were recovered at the East Texas gasoline plant of Arkansas Fuel Oil Corp., the Spear plant of Gulf Oil Corp., the Sabine plant of Magnolia Petroleum Co., Plant 18 of Sinclair Oil & Gas Co., and Plants 31 and 47 of Warren Petroleum Corp. There were two exploratory well completions during the year, both of which proved dry. Premier Oil & Refining Co. began a $1.25 million improvement program at its Longview refinery with installation of a new platformer and a new Unifiner unit.

**Grimes.**—Production of 15,000 barrels of crude oil from 2 oilfields and 734 million cubic feet of natural gas was reported in the county in 1956.

**Guadalupe.**—The Fraser Brick Co. mined shale for manufacturing building brick and other heavy clay products. The oil and gas industry produced 4.5 million barrels of crude oil from 14 oilfields and 51 million cubic feet of natural gas during the year. Of 47 well completions totaling 74,013 feet, 1 was an oil well and 46 were dry holes.

**Hale.**—Production of 2.6 million barrels of crude oil from 4 oilfields and 108 million cubic feet of natural gas was reported by the oil and gas industry in Hale County.

**Hall.**—Building and paving sand was produced from pits near Memphis by W. F. McElreath.

**Hamilton.**—Limestone was crushed and quarried for concrete and roadstone by Division 9 of the Texas Highway Department. Building sand was prepared by O. F. Striplin.

Production of 1.9 billion cubic feet of natural gas and 400 barrels of crude oil was reported in the county.

**Hansford.**—Natural-gas liquids were recovered at the Hansford and Sherman gasoline plants of Phillips Petroleum Co. The oil and gas industry produced 571,000 barrels of crude oil and 20.2 billion cubic feet of natural gas during the year. A dehydration plant, with gathering pipelines and associated facilities, was completed by Northern Natural Gas Co. There were 21 exploratory well completions totaling 140,229 feet, resulting in 3 oil discoveries, 5 new oil pays, 3 new gas pays, and 8 dry holes.

**Hardeman.**—In all, 6,000 barrels of crude oil was produced from 2 oilfields during the year. All three exploratory well completions reported during the year were dry holes.

Crude gypsum was mined both underground and by open pit and was prepared for the building industry at the Acme plant of Certain-

Digitized by Google

Teed Products Corp. These properties were acquired by the Bestwall Gypsum Co. during the year.

**Hardin.**—Natural-gas liquids were recovered at the Nos. 25 and 6 cycling plants of Sinclair Oil & Gas Co. The oil and gas industry produced 9 million barrels of crude oil from 54 oilfields (2 fields produced over 1 million barrels each) and 48.6 billion cubic feet of natural gas during the year. Of 15 exploratory well completions totaling 129,524 feet, 2 proved oil wells, 1 a gas well, and 12 were dry holes.

Miscellaneous stone was quarried and crushed for concrete and roadstone for Division 10 of the Texas Highway Department. Molding sand was prepared by Barry & Barry.

**Harris.**—Harris County was the sixth ranking county in total mineral value ($128.9 million) and in crude-oil production. The oil and gas industry produced 28.6 million barrels of crude oil from 78 oilfields (6 produced over 1 million barrels each) and 57.5 billion cubic feet of natural gas. Natural-gas liquids were recovered at the North Houston cycling plant of Distillate Production Corp., the Ehrhardt cycling plant of H. M. Harrell, and the Clear Lake and Tomball gasoline plants of Humble Oil & Refining Co. Tennessee Products Pipeline Co. began constructing a fractionation plant at La Porte. Crude oil was processed at 7 refineries having a daily throughput capacity of 662,000 barrels; 13,000 barrels daily capacity was shut down in 1956. Exploratory drilling totaled 72 completions with a total depth of 567,904 feet. Nine completions were oil wells, 7 were gas wells, and 56 were dry holes.

Iron ores from Texas and from foreign countries were used as feed stock for the blast furnaces of Sheffield Division of Armco Steel Corp. Sheffield Steel Co. began operation of a new 100-ton electric furnace at its Houston mill.

Sand and gravel, used principally for building and paving purposes, was recovered at a portable plant near Pasadena by Albers Bank Sand Co. and with dredges near Highlands by Horton & Horton, Johnson & Johnson, and Parker Bros. & Co., Inc.

Portland cement was prepared from oystershell by Ideal Cement Co., Lone Star Cement Corp., and General Portland Cement Co. A $15-million expansion program at the Ideal Cement Co. new Houston plant, which will add 2.75 million barrels capacity to a total of 4 million barrels, was delayed by the midyear steel strike. A feature of the new plant facilities was the degree of electronic control of plant operations; kilns will be "burned" by television, while grinding mills, elevators, pumps, and other facilities will be controlled from a central station.

Salt in brine was recovered from wells near Houston by the Texas Brine Corp. and was mined underground and prepared as rock salt and as pressed block at the Hockley plant of United Salt Corp.

Crude perlite shipped in from adjoining States was expanded at the Houston plants of Perlite of Houston, Inc., and the Trilite Corp. for use by the construction industry in plaster and concrete. Miscellaneous clay or shale was mined from open pits near Houston and used in manufacturing building brick and heavy clay products by Acme Brick Co., Cedar Bayou Brick & Tile Co., J. M. Cordell & Sons, Inc., and Houston Brick & Tile Co. Barite from foreign coun-

Digitized by Google

tries and other States, was crushed and ground for use in preparing drilling muds at the Houston plants of Baroid Division, National Lead Co., and the Milwhite Co., Inc. Crude vermiculite from adjoining States was expanded for lightweight aggregate in concrete and building plaster at the Houston plants of the Trilite Corp. and Vermiculite Products, Inc.

Lime was prepared from oystershell at the Pasadena plant of Champion Paper & Fibre Co. to be utilized in manufacturing paper and fiberboard at the Houston plant at Nyotex Chemical Co. for use in making industrial chemicals, and at the Houston plant of Sheffield Division of Armco Steel Corp. as a metallurgical flux.

Sulfur was recovered in purifing sour natural gas at the Baytown plant of Consolidated Chemical Industries, Inc., at the Deer Park refinery of Shell Chemical Corp., and at the Houston refinery of Sinclair Refining Co. A $2-million expansion program at the chemical plant of Merichem Co. resulted in doubling the crisylic acid phenol capacity to 150,000 gallons per month and quadrupling the sodium sulfide production to 1,000 tons per month. Shell Chemical Co. was building 2 distillation towers, 4 converters, and additional water-cooling facilities to increase its isopropyl alcohol output by 20 million pounds per year.

The Humble Oil & Refining Co. installed a new Udex unit at its Baytown refinery to produce 7,000 barrels of aromatics daily. An expansion program at the company Baytown butadiene plant increased plant capacity from 49,000 to 65,000 short tons of butadiene per year. Humble also began constructing a $3-million ethylene plant designed to recover 80 million pounds of ethylene from refinery gases annually. A new $4-million asphalt plant to produce 5,000 barrels of paving asphalt per day was built on the Houston ship channel by Texas Asphalt & Refining Co. The plant will mix heavy Boscan crude from Venezuela with Gulf coast distillate to yield a 53-percent asphalt product.

A multi-million-dollar expansion program of the Houston plant of Diamond Alkali Co. will double the perchlorethylene capacity. Phillips Petroleum Co. began operating the first unit of its 110 million-pounds-per-year polyethylene plant on the Houston ship channel early in 1956. Warren Petroleum Corp. was building a $5-million petrochemical plant and warehouse near Houston. The Celanese Corp. of America began a multi-million dollar expansion at its polyolefin resin plant to 40 million pounds per year and the development of a new type of polyethylene plastic which can be produced at low pressure in the presence of a finely dispersed catalyst. A plant to produce new types of polyolefin plastics was completed by the M. W. Kellogg Co.

**Harrison.**—Miscellaneous clay or shale was mined from open pits near Waskom by Acme Brick Co. and from pits near Marshall by Marshall Brick Co. for use in heavy clay products. The Marshall Pottery Co. mined fire clay and shale for stoneware and hard pottery.

Lignite was mined from open pits near Marshall by McAlester Fuel Co.

The 29 producing oilfields in the county yielded 1.7 million barrels of crude oil. Natural gas totaling 104.5 billion cubic feet was produced. Natural-gas liquids were recovered at the Whelan gasoline plant of

465877—58——70

Digitized by Google

H. L. Hunt, the Waskom plant of Arkansas Louisiana Gas Co., the Jonesville plant of Le Cuno Oil Corp., the Waskom plant of Waskom Natural Gas Corp., the Whelan plant of D. E. and R. J. Whelan, and the Woodlawn plant of Woodlawn Processing Corp. Exploratory drilling totaled 67,532 feet for 11 completions and resulted in 3 oil discoveries, 2 new oil pays, 1 new gas pay, and 5 dry holes.

**Hartley.**—The oil and gas industry produced 84,000 barrels of crude oil from 1 oilfield and 34.0 billion cubic feet of natural gas during 1956. Four exploratory wells totaling 28,422 feet proved dry.

**Haskell.**—Production of crude oil, natural gas, natural-gas liquids, and sand and gravel valued at $9.6 million was reported in Haskell County in 1956. The oil and gas industry produced 3.4 million barrels of crude oil from 66 oilfields and 141 million cubic feet of natural gas. Of 58 exploratory well completions totaling 265,996 feet, 9 proved to be oil discoveries, 1 new oil pay, and 45 dry holes. Miscellaneous gravel was produced by W. W. Kittley.

**Hays.**—Limestone was quarried and crushed for concrete aggregate and roadstone by Borden Construction Co. Building and paving sand and gravel were recovered from pits near San Marcos by the Hays County Gravel Co.

**Hemphill.**—The oil industry produced 7,000 barrels of crude oil from 1 oilfield during 1956.

**Henderson.**—Natural-gas liquids were recovered at the Opelika cycling plant of Lone Star Producing Co. Production of 896,000 barrels of crude oil from 7 oilfields and 4.3 billion cubic feet of natural gas was reported. Exploratory drilling totaling 128,666 feet proved 1 oil discovery well and 25 dry holes.

Miscellaneous clay or shale was mined from open pits near Athens by Athens Brick Co., Inc., Athens Tile & Pottery Co., and Texas Clay Products Co. Fire clay for use in refractories was mined from open pits by Harbison-Walker Refractories Co. The new 50,000 brick-per-day plant of Athens Brick Co., Inc., began producing July 27.

**Hidalgo.**—The oil and gas industry produced 739,000 barrels of crude oil from 23 oilfields and 40.2 billion cubic feet of natural gas. Crude oil was processed at the La Blanca refinery of Cactus Petroleum, Inc., and at the McAllen refinery of Rado Refining Co. Rado Refining Co. added 1,500 barrels-per-day crude capacity to its McAllen refinery. Natural-gas liquids were recovered at the Delhi-Taylor cycling plant of Delhi-Taylor-Mayfair Oil Corp. Of 25 exploratory well completions totaling 225,216 feet, 1 proved an oil well, 11 proved gas wells, and 13 holes were dry.

Building and paving sand and gravel were produced by Fordyce Gravel Co. and Crow Gravel Co. Miscellaneous clay used in heavy clay products was mined from open pits by Valley Brick & Tile Co.

**Hill.**—Paving gravel and crushed limestone for concrete aggregate and roadstone were produced under contract for Division 9 of the Texas Highway Department.

**Hockley.**—The oil and gas industry produced 14.9 million barrels of crude oil from 73 oilfields (1 produced more than 1 million barrels of crude) and 19.9 billion cubic of natural gas. Of 38 well completions in 1956, 14 were exploratory wells, totaling 121,476 feet, and 24 were development wells. Natural-gas liquids were recovered at the

Digitized by Google

Ropes gasoline plant of Honolulu Oil Corp. and at the Levelland and Slaughter plants of Stanolind Oil & Gas Co.

Sulfur was recovered at the Sundown plant of Pan American Petroleum Corp.

**Hopkins.**—Production of 2.4 million barrels of crude oil from 5 oilfields and 3.5 billion cubic feet of natural gas was reported in 1956. Natural-gas liquids were recovered at the Pickton gasoline plant of Humble Oil & Refining Co. Exploratory drilling totaled 34,997 feet and resulted in 6 dry holes.

Fire clay used in refractories was produced from open pits by A. P. Green Fire Brick Co.

**Houston.**—Sandstone was quarried and crushed under contract for Division 11 of the Texas Highway Department and used for concrete and roadstone.

Natural-gas liquids were recovered at the cycling plant of Grier-Jackson, Inc. The oil and gas industry produced 578,000 barrels of crude oil from 2 oilfields and 13.5 billion cubic feet of natural gas. The industry completed 18 wells; 10 were exploratory wells totaling 72,256 feet, and 8 were development wells.

**Howard.**—The oil and gas industry produced 15 million barrels of crude oil from 23 oilfields (6 of which yielded over 1 million barrels each), and 5.9 billion cubic feet of natural gas. Crude oil was processed at the Big Spring refinery of Cosden Petroleum Corp. Carbon black was recovered from refinery residues. Of 319 well completions, 18 were exploratory (totaling 115,273 feet), and 301 were development wells. Natural-gas liquids were recovered at the East Vealmoor gasoline plant of Reef Fields Gasoline Corp.

The Cosden Petroleum Corp. purchased the 7,000-barrel Abilene refinery of Onyx Refining Co. and the 12,000-barrel Colorado City refinery of Col-Tex Refining Co. in a stock-transfer trade. Cosden likewise expanded and modernized its Big Spring refinery with the installation of a $2.5 million rexformer unit. This would permit the BTX plant full-time production of aeromatic chemicals and to increase the refinery's output of nitration grade of benzene, toluene, and xylene. Other refinery expanded facilities included a 100-mile products pipeline from the refinery to Cosden's Abilene terminal, a 2,100-barrel-per-day unifining unit, and modernization of a $1-million catalytic cracker. Cosden Petroleum Co. also began constructing a $3 million, 20-million-pound styrene plant at which synthetic rubber and plastics will be manufactured.

Building and paving sand and gravel were recovered from pits near Big Spring by Clyde McMahon Sand & Gravel Co. and West Texas Sand & Gravel Co.

**Hudspeth.**—Limestone was quarried and crushed for concrete aggregate and roadstone under contract for Division 24 of the Texas Highway Department. Miscellaneous stone was quarried and crushed near Van Horn for riprap, concrete aggregate, railroad ballast, and roadstone by Gifford Hill & Co., Inc.

Talc was mined from open pits by Christian & Sons, Lone Star Mining Co., and Southwestern Talc Corp. Soapstone was mined by Glenn-Rey Corp. Gypsum was recovered from open pits for use as a retarder in special cements by Southwestern Portland Cement Co.

Digitized by Google

**Hunt.**—Limestone was quarried and crushed near Quinlan for concrete aggregate and roadstone by John F. Buckner & Sons.

The oil industry produced 15,000 barrels of crude oil from 3 oilfields and completed 7 exploratory wells for a total of 36,083 feet; all wells proved dry.

**Hutchinson.**—Carbon black was recovered at 4 furnace plants and 1 contact plant; 2 plants used sour natural gas for fuel, and 3 used heavy refinery residues. Natural-gas liquids were recovered at the Canadian, Pantex, Rock Creek, and Sanford gasoline plants of Phillips Petroleum Co., the Sanford plant of Frank C. Henderson Trust No. 2, the Huber plant of J. M. Huber Corp., and the Fritch—151 plants of Natural Gas Pipeline Co. of America.

The oil and gas industry produced 14.2 million barrels of crude oil from 2 oilfields (the Hutchinson County field alone produced more than 1 million barrels) and 119.9 billion cubic feet of natural gas. Of 518 well completions in 1956, 3 were exploratory wells totaling 22,857 feet, and resulted in 1 oil discovery, 1 new gas pay, 1 dry hole, and 515 were development wells.

A $15.6-million expansion program at the Borger refinery of Phillips Petroleum Co. included additions and improvements to the distillation, cracking, alkylation, hydrogenation, and fractionation units; also a 139-mile, 12-inch loop of its products line from Borger to St. Louis to increase the products-line capacity several thousand barrels daily.

Paving gravel was produced under contract for Division 4 of the Texas Highway Department.

**Irion.**—The oil and gas industry produced 200,000 barrels of crude oil from 20 oilfields and 6 million cubic feet of natural gas. The industry completed 88 wells; 47 were exploratory wells totaling 260,703 feet and resulted in 13 oil wells and 34 dry holes and 41 were development wells.

**Jack.**—Production of 6.8 million barrels of crude oil from 128 oilfields and 20.3 billion cubic feet of natural gas was reported in Jack County in 1956. Natural-gas liquids were recovered at the Black Hawk gasoline plant of Black Hawk Gasoline Corp. and the Brazos cycling plant of Brazos River Gas Co. A new gasoline plant to process 4 million cubic feet of gas daily from the East Risch field was completed by the Centurion Gas & Oil Co. Crude oil was processed at the Bryson Refinery of Bryson Pipe Line & Refining Co. The oil and gas industry completed 269 wells consisting of 162 development wells and 107 exploratory wells. Exploratory drilling totaled 449,023 feet, and resulted in 8 oil discoveries, 10 gas discoveries, and 83 dry holes.

**Jackson.**—Natural-gas liquids were recovered at the Francitas No. 1 cycling plant of Francitas Gas Co. and at the Vanderbilt gasoline plant of Magnolia Petroleum Co. The oil and gas industry produced 13.6 million barrels of crude oil from 65 oilfields (4 produced over 1 million barrels each) and 37.4 billion cubic feet of natural gas. There were 101 well completions in 1956, consisting of 53 development wells and 48 exploratory wells. Exploratory drilling totaled 369,424 feet, resulting in 2 oil discoveries, 2 gas discoveries, and 43 dry holes.

**Jasper.**—The oil and gas industry produced 211,000 barrels of crude oil from 14 oilfields and 1.4 billion cubic feet of natural gas in 1956. The industry drilled 16 wells—3 development and 13 exploratory; ex-

Digitized by Google

ploratory drilling totaled 109,339 feet, resulting in 3 oil discoveries and 2 new oil pays.

Bentonite was recovered from open pits near Brookeland by Bennett-Clark Co., Inc. Miscellaneous clay used in the manufacture of heavy clay products was mined from open pits by Pal-Port Clay Products Corp. Limestone was quarried and crushed for concrete aggregate and roadstone for Division 11 of the Texas Highway Department. Miscellaneous stone was quarried and crushed for concrete aggregate and roadstone purposes for Division 20 of the Texas Highway Department.

**Jeff Davis.**—Paving gravel was produced under contract for Division 24 of the Texas Highway Department.

**Jefferson.**—The oil and gas industry produced 8.4 million barrels of crude oil from 36 oilfields (3 of these yielded over 1 million barrels each) and 79.2 billion cubic feet of natural gas. There were 91 well completions, 39 were exploratory wells totaling 381,875 feet proving 2 oil wells and 4 gas wells; 52 were development wells. Daily throughput capacity of the oil-refining industry totaled 931,000 barrels, 38,700-barrel capacity of which was idle during 1956. There were 6 refineries in Jefferson County: Atlantic Refining Co., Gulf Oil Corp., and The Texas Co. at Port Arthur; Magnolia Petroleum Co. at Beaumont; Pure Oil Co. at Nederland; and The Texas Co. at Port Neches. Atlantic Refining Co. added a 15,000 barrel-per-day catformer at its Atrico refinery. Steam and electric generating facilities, 3 new steam units, and a 15,000-kilowatt generator were added to the Port Arthur refinery of The Texas Co. Natural-gas liquids were recovered at the Texas gasoline plant of Texas Gas Corp.

Building sand was dredged from pits near Beaumont by C. A. McKinley Sons, Inc. Miscellaneous stone was quarried and crushed for concrete aggregate and roadstone for Division 20 of the Texas Highway Department. Oystershell was dredged from Sabine Lake by W. T. Burton. Miscellaneous clay, used in the manufacture of heavy clay products, was mined from open pits by Beaumont Brick Co., Inc.

Native sulfur was recovered by the Frasch method from Spindletop dome by Texas Gulf Sulphur Co. Sulfur was recovered from hydrogen sulfide gas at the Port Arthur refinery of Gulf Oil Corp. A Frasch extraction plant was being built by Texas Gulf Sulphur Co. on the Fannett salt dome, where production was expected early in 1957.

Magnolia Petroleum Co. began constructing a 100,000-barrel-per-day crude distillation unit which would eventually replace 7 smaller crude units at its Beaumont refinery. The company also completed a $25 million expansion program to enable higher octane gasoline production. Facilities included the world's largest thermoform catalytic cracking unit and the Southwest's first sovaformer unit. The world's largest fluid catalytic cracking unit, with a rated throughput capacity of 90,000 barrels per day, including 30,000 barrels of recycle stock, was being built by The Texas Co.

Gulf Oil Corp. was nearing completion of a 5-year building program at its Port Arthur refinery, which included expansions in the polymerization, alkylation, and sulfur-recovery units of the refinery. New catalytic reforming facilities produced hydrogen as a byproduct to be

Digitized by Google

used in a new process to yield higher quality home-heating oils. Pure Oil Co. installed a 15,000 barrel-per-day ultraforming unit at its Smiths Bluff refinery.

A new salt producer, Spindletop Minerals Co., obtained salt in brine from several new wells drilled into a salt dome. Production was rated at 50,000 barrels per day for consumption by the area chemical and processing plants. Full-scale production of an 18-million-pound-per-year polyethylene plant of the Koppers Co. was begun early in the year. Jefferson Chemical Co. expanded production facilities for chlorine, caustic soda, ethylene, ethylene oxide, and other basic chemicals at its Port Neches chemical plant.

**Jim Hogg.**—The oil and gas industry produced 1.9 million barrels of crude oil from 45 oilfields, as well as 1.2 billion cubic feet of natural gas. The industry completed 99 wells; 36 were exploratory wells totaling 116,732 feet resulting in 2 oil pays and 1 gas discovery, and 63 were development wells.

**Jim Wells.**—Natural-gas liquids were recovered at the LaGloria cycle plant of LaGloria Oil & Gas Co. and at the Seeligson plant of Magnolia Petroleum Corp. Production of 14.7 million barrels of crude oil from 117 oilfields and of 81.4 billion cubic feet of natural gas was reported in the county in 1956. Of 125 well completions, 47 were exploratory and 78 development wells. Exploratory drilling totaled 268,188 feet, proving 3 oil discoveries, 2 new oil pays, 2 gas discoveries, and 5 new gas pays.

**Johnson.**—Lime for chemical and industrial purposes was produced by Texas Lime Co. Sandstone was quarried and crushed for concrete aggregate and roadstone by John F. Buckner & Sons. Limestone was quarried and crushed under contract for use as concrete aggregate and roadstone for Division 2 of the Texas Highway Department. Glass sand and building gravel were prepared by Lain Gravel Co., Inc.

**Jones.**—There were 145 oilfields in Jones County (1 of these produced over 1 million barrels of crude oil alone), which yielded 7.1 million barrels of crude oil during 1956. Natural-gas production totaled 1.8 billion cubic feet. Natural-gas liquids were recovered at the Winberly No. 1 gasoline plant of Texas Natural Gasoline Corp. Crude oil was processed at the Lueders refinery of Petroleum Products Refining & Producing Co. The oil and gas industry completed 263 wells; 93 were exploratory wells and 170 development wells. Exploratory drilling totaled 311,459 feet, and proved 26 oil wells.

Building sand and building and paving gravel were prepared from open pits near Abilene by the R. E. Janes Gravel Co., Inc. Rough and finished dimension limestone was prepared from quarries near Lueders by Lueders Limestone Co. and West Texas Stone Co. West Texas Stone Co. likewise produced riprap.

**Karnes.**—Natural-gas liquids were recovered at the Cabeza Creek and Karnes City gasoline plants of United Gas Pipe Line Co. The oil and gas industry produced 2.7 million barrels of crude oil from 19 oilfields, as well as 4.7 billion cubic feet of natural gas. Of 48 well completions in the county, 15 were exploratory and 33 development wells. Exploratory drilling totaled 82,163 feet; all of these holes proved dry. The United Gas Pipe Line Co. added a propane-recovery

Digitized by Google

unit to its Cabeza Creek gasoline plant, as well as auxiliary units to increase butane production.

**Kaufman.**—Limestone was quarried and crushed under contract for concrete aggregate and roadstone for Division 18 of the Texas Highway Department. Production of 1.2 million barrels of crude oil from 18 oilfields and of 109 million cubic feet of natural gas was reported in 1956. The oil and gas industry completed 20 exploratory wells totaling 89,500 feet; all were dry.

**Kenedy.**—Seven oilfields in Kenedy County yielded 307,000 barrels of crude in 1956; 3.4 billion cubic feet of natural gas was produced. Natural-gas liquids were recovered at the Julian Pasture cycle plant of Humble Oil & Refining Co. Of 11 well completions in 1956, 7 were exploratory and 4 development wells. Exploratory drilling totaled 68,522 feet, resulting in 2 oil pays, 1 gas discovery, and 1 gas pay.

**Kent.**—The oil and gas industry produced 6.3 million barrels of crude oil from 14 oilfields, plus 2.1 billion cubic feet of natural gas. The oil and gas industry completed 30 wells—20 exploratory and 10 development. Exploratory drilling totaled 146,257 feet; all holes proved dry.

**Kimble.**—Paving sand and gravel was produced from pits near Junction by Weirich Bros. Four oilfields in Kimble County yielded 2,000 barrels of crude oil during the year. Of 93 well completions in 1956, 78 were exploratory wells and 15 development wells. Exploratory drilling totaled 73,000 feet, resulting in 6 oil wells and 8 gas wells.

**King.**—The oil and gas industry produced 1.3 million barrels of crude oil from 10 oilfields and 196 million cubic feet of natural gas during 1956. Of 21 well completions during the year, 9 were exploratory and 12 development. Exploratory drilling totaled 42,197 feet, with 1 oil discovery, 1 new oil pay, and 7 dry holes.

Limestone was quarried and crushed for concrete aggregate and roadstone for Division 25 of the Texas Highway Department.

**Kleberg.**—Limestone was quarried and crushed from pits near Kingsville for concrete aggregate and roadstone by Heldenfels Bros. Production of 4.4 million barrels of crude oil (from 56 oilfields) and 104 million cubic feet of natural gas was reported in 1956. Thirteen exploratory well completions totaled 126,057 feet, resulting in 4 new oil pays, 2 new gas pays, 1 gas discovery, and 6 dry holes.

**Knox.**—Production of 1 million barrels of crude oil from 18 oilfields, as well as 241 million cubic feet of natural gas, was reported in Knox County in 1956. The oil and gas industry completed 336 wells, of which 170 were exploratory and 166 development wells. Exploratory drilling totaled 424,427 feet, proving 11 oil discoveries, 3 oil extensions, and 155 dry holes.

Paving gravel was prepared under contract for Division 25 of the Texas Highway Department.

**Lamar.**—Building and paving sand and gravel were prepared by the Skeen Sand & Gravel Co.

**Lamb.**—Production of 437,000 barrels of crude oil (from 1 oilfield) and 1 million cubic feet of natural gas was reported in 1956. Five exploratory well completions totaled 23,142 feet; all were dry holes.

**Lampasas.**—Paving sand and gravel was produced from pits near Lampasas by Lampasas Sand & Gravel Co.

Digitized by Google

**La Salle.**—Five oilfields yielded 346,000 barrels of crude oil in 1956. Natural-gas production totaled 1 billion cubic feet. Of 89 well completions in 1956, 20 were exploratory and 69 development. Exploratory drilling totaled 124,684 feet, proving 2 oil wells, 2 gas wells, and 16 dry holes.

**Lavaca.**—Natural-gas liquids were recovered at the Wilcox gasoline plant of Goliad Corp. and the Provident City plant of Shell Oil Co. Production of 293,000 barrels of crude oil (from 11 oilfields) and of 68.1 billion cubic feet of natural gas was reported. Of 8 exploratory well completions totaling 69,812 feet, 1 was an oil well, 2 were gas wells, and 5 were dry holes.

Sandstone was crushed for concrete aggregate and roadstone for Division 13 of the Texas Highway Department.

**Lee.**—Production of 2,000 barrels of crude oil from 1 oilfield was reported in Lee County in 1956.

**Leon.**—The oil and gas industry produced 135,000 barrels of crude oil from 2 oilfields and 23.4 billion cubic feet of natural gas during the year. The industry completed 9 exploratory wells totaling 57,458 feet, resulting in 1 oil discovery; 8 wells were dry holes.

**Liberty.**—Production of 14.6 million barrels of crude oil from 46 oilfields and 20.9 billion cubic feet of natural gas was reported in 1956. Of 228 well completions in Liberty County, 32 were exploratory wells and 196 were development wells. Exploratory drilling totaled 293,502 feet, proving 3 oil discoveries and 29 dry holes. Natural-gas liquids were recovered at Hull gasoline plant of West Gasoline Co. Underground storage for 1.2 million barrels of LP-gases was completed by Magnolia Petroleum Co.

Texas Gulf Sulphur Co. recovered native sulfur from the Moss Bluff dome by the Frasch method. Miscellaneous stone was quarried and crushed for concrete aggregate and roadstone for Division 20 of the Texas Highway Department. Building and paving sand and gravel were prepared from pits near Cleveland by Costal Sand & Gravel Co., Inc., and Texas Construction Material Co.

**Limestone.**—Miscellaneous clay, used in heavy clay products, was mined from open pits near Groesbeck by the Barron Brick Co. Limestone was quarried and crushed for concrete aggregate and roadstone for Division 9 of the Texas Highway Department.

The oil and gas industry produced 339,000 barrels of crude oil from 5 oilfields and 9.3 billion cubic feet of natural gas during the year. Of 26 exploratory well completions during the year (totaling 68,132 feet), all proved to be dry.

**Lipscomb.**—Lipscomb became a new gas-producing county when Humble Oil & Refining Co. developed 11 million cubic feet flow of gas per day from perforations at 9,747–9,764 feet in a wildcat well 6 miles northeast of Lipscomb. Production of 2,000 barrels of crude oil from 1 oilfield was reported during the year. Of 10 exploratory wells completed in 1956, totaling 93,336 feet, 1 was a gas discovery, and 9 were dry holes.

**Live Oak.**—Natural-gas liquids were recovered at the Kittie gasoline plant of Goliad Corp. and at the Live Oak plant of Western Natural Gas Co. The Goliad Corp. added a $185,000, 1,370 barrel-per-day butane splitter to the Kittie plant. Production of 1.8 million barrels of crude oil from 47 oilfields and 52.5 billion cubic feet of natural

Digitized by Google

gas was reported during the year. Crude oil was processed at the plant of Three Rivers Refining Co. Paving sand and gravel was prepared by Commercial Materials, Inc. The oil and gas industry completed 140 wells, 40 of which were exploratory wells, totaling 203,675 feet, and 100 were development wells. Exploratory drilling proved 3 oil discoveries, 2 new oil pays, 2 gas discoveries, 2 new gas pays, and 31 dry holes.

**Llano.**—Crude feldspar was recovered from open pits near Llano by Mrs. Tillie Badu Moss. Marble was quarried and crushed from pits near Llano for use as terrazzo by Dezendorf Marble Co. A graphitic schist was quarried for filter material from pits one mile south of Llano by Graphilter Corp. Talc from Hudspeth County and soapstone from Gillespie County were ground at Llano by Southwestern Talc Corp.

**Loving.**—The oil and gas industry produced 1.6 million barrels of crude oil from 4 oilfields and 1.3 billion cubic feet of natural gas during 1956. Of 4 exploratory well completions totaling 29,345 feet, 1 proved an oil well, and 3 were dry holes.

**Lubbock.**—Two oilfields yielded 652,000 barrels of crude oil during the year. Natural-gas production amounted to 2 million cubic feet.

Building sand and gravel was prepared from pits by Chancey Sand & Gravel Co. and Caprock Sand & Gravel Co. Limestone was quarried and crushed for concrete aggregate and roadstone by Division 5 of the Texas Highway Department.

**Lynn.**—Five oilfields yielded 159,000 barrels of crude oil during 1956. Natural-gas production amounted to 1 million cubic feet. The oil and gas industry completed 12 exploratory wells for a total of 62,858 feet, proving 2 oil wells and 10 dry holes.

**Madison.**—The oil and gas industry produced 20,000 barrels of crude oil (from 2 oilfields) and 8.9 billion cubic feet of natural gas during the year.

**Marion.**—Production of 1.1 million barrels of crude oil (from 10 oilfields) and of 12.7 billion cubic feet of natural gas was reported. Natural-gas liquids were recovered at the Jefferson and Smithland gasoline plants of Arkansas Louisiana Gas Co. The oil and gas industry completed 113 wells—15 exploratory and 98 development. Exploratory drilling totaling 98,275 feet resulted in 1 oil discovery, 2 new oil pays, and 12 dry holes.

**Martin.**—Paving sand was prepared under contract for United States Army Corps of Engineers at Albuquerque, N. Mex.

Five oilfields yielded 641,000 barrels of crude oil during the year. Natural-gas production amounted to 112 million cubic feet. Of 9 exploratory well completions totaling 62,610 feet, 1 was an oil discovery, and 8 were dry holes.

**Matagorda.**—Natural-gas liquids were recovered at the Blessing cycling plant of American Liberty Oil Co. and at the Markham gasoline plant of Ohio Oil Co. Production of 5.9 million barrels of crude oil from 30 oilfields and 153.6 billion cubic feet of natural gas was reported in the county. The oil and gas industry completed 37 exploratory wells for a total of 342,498 feet, proving 2 oil discoveries, 2 new oil pays, 1 gas discovery, and 5 new gas pays; 26 wells were dry holes.

Digitized by Google

Shell was dredged from the shallow waters of Matagorda Bay by Matagorda Shell Co.

**Maverick.**—Production of 12,000 barrels of crude oil from 3 oilfields and 134 million cubic feet of natural gas was reported from the county in 1956. Of 23 exploratory well completions totaling 69,131 feet, 1 proved to be an oil discovery, and 1 a new oil pay; 21 were dry holes. Reynolds Metals Co. completed a fluorspar processing and refining plant at Eagle Pass. The plant will process fluorspar mined by a Mexican subsidiary to produce Acid-grade fluorspar. The company will use it in manufacturing synthetic cryolite.

**McCulloch.**—In all, 1,000 barrels of crude oil was produced in McCulloch County in 1956. The oil industry completed 11 exploratory wells totaling 10,309 feet; all wells were dry holes.

**McLennan.**—One oilfield yielded 6,000 barrels of crude oil during the year.

Portland and masonry cements were produced at the Waco plant of Universal Atlas Cement Co. Limestone was quarried and crushed by Universal Atlas Cement Co. for use in cement and by Division 9 of the Texas Highway Department for concrete aggregate and roadstone. Limestone was quarried and cut for rough and finished architectural stone by the Tonk Quarry.

Building and paving sand and gravel and gravel for railroad ballast were prepared from pits near Waco by Central Texas Gravel Co., Kleberg Sand & Gravel Co., and Neelley Sand & Gravel, Inc.

**McMullen.**—The oil and gas industry produced 920,000 barrels of crude oil from 20 oilfields and 14.8 billion cubic feet of natural gas during the year. The industry completed 35 exploratory wells for a total of 171,445 feet, resulting in 1 oil discovery, 1 new oil pay, 1 gas discovery, 3 new gas pays, and 27 dry holes.

**Medina.**—Three oilfields yielded 49,000 barrels of crude oil during the year. The oil and gas industry completed 151 wells, 23 were exploratory wells totaling 36,181 feet, and 128 were development wells. All exploratory wells proved dry.

Miscellaneous clay for use in heavy clay products was mined from open pits by D'Hanis Brick & Tile Co.

**Midland.**—Natural-gas liquids were recovered at the Spraberry gasoline plant of Phillips Petroleum Co., the Sweetie Peck plant of El Paso Natural Gas Co., the Pegasus plant of Magnolia Petroleum Co., and the Midland plant of the Pecos Co. Cities Service Oil Co. was building a gasoline plant between Midland and Odessa; it will process 50 million cubic feet of gas daily to produce 225,000 gallons of natural-gas liquids.

Production of 17.8 million barrels of crude oil from 41 oilfields (3 of these produced more than 1 million barrels each), and 74.2 billion cubic feet of natural gas was reported. The oil and gas industry completed 155 wells; 12 were exploratory wells and 143 development wells. Exploratory drilling totaled 102,998 feet, resulting in 2 oil discoveries, 6 new oil pays, 1 gas discovery, and 3 dry holes.

Limestone was quarried and crushed under contract for use in concrete aggregate and road stone for Division 6 of the Texas Highway Department. Crude perlite from adjoining States was expanded at the Terminal plant of Perlite Industries, Inc.

**Milam.**—One oilfield yielded 100,000 barrels of crude oil during the

Digitized by Google

year. Natural-gas production amounted to 111 million cubic feet. Of 28 well completions, 5 were exploratory wells totaling 24,440 feet (all were dry holes) and 23 were development wells.

Operation of two new potlines was begun at the Rockdale reduction works of Aluminum Company of America.

Paving gravel was mined from pits by W. C. Moody and by Mrs. W. A. Robinson.

**Mitchell.**—The oil and gas industry produced 2.5 million barrels of crude oil from 16 oilfields, 2 of which produced more than 1 million barrels each, and 27 million cubic feet of natural gas. Exploratory drilling totaled 60,788 feet, proving 1 oil discovery, 1 new oil pay, and 16 dry holes. Crude oil was processed at the Colorado City refinery of Cosden Oil Co. which purchased the plant from Col-Tex Refining Co. during the year.

Building and paving sand and gravel were produced by the Colorado Sand & Gravel Co.

**Montague.**—Production of 7.8 million barrels of crude oil from 162 fields and 9.2 billion cubic feet of natural gas was reported during 1956. Natural-gas liquids were recovered at the Bowie gasoline plant of Bowie Gasoline Co. Exploratory drilling totaling 244,421 feet proved 13 oil discoveries; 32 wells were dry holes.

Building and paving sand and gravel were produced by Watson Sand & Gravel Co. from a plant near Bowie.

**Montgomery.**—Natural-gas liquids were recovered at the Lake Creek cycling plant of Superior Oil Co. and at the Conroe gasoline plants of Humble Oil & Refining Co. and Midland Gasoline Co. Of 30 exploratory well completions, totaling 222,266 feet, 2 were gas-condensate discoveries and 28 were dry holes.

Carbon black was recovered at the furnace plant of Columbian Carbon Co.

Paving sand and gravel was produced under contract for Division 12 of the Texas Highway Department.

**Moore.**—Natural-gas liquids were recovered at the Bivins and Four-Way gasoline plants of Colorado Interstate Gas Co., at the Cactus No. 12 plant of Kerr-McGee Oil Industries, Inc., at Station-152 of National Gas Pipeline Co. of America, at the Dumas and Sneed plants of Phillips Petroleum Co., and at the McKee-Sunray plant of Shamrock Oil & Gas Corp.

Crude oil was processed at the Sunray plant of Shamrock Oil & Gas Corp. Helium was recovered at the Exell plant operated by the Government. The oil and gas industry produced 123,000 barrels of crude oil and 386.9 billion cubic feet of natural gas during the year. Four exploratory wells, totaling 16,029 feet, were dry.

Carbon black was recovered at the Sunray furnace plant of Continental Carbon Co.

Sulfur was recovered from hydrogen sulfide of sour natural gas at the Sunray plant of Shamrock Oil & Gas Corp.

**Morris.**—Brown iron ore was mined from open pits by Lone Star Steel Co. and consumed in the blast furnace of its Daingerfield intergrated steel mill. A $6-million expansion program, which will increase the plant's annual ingot capacity by 100,000 tons, was nearing completion. New facilities included an open-hearth furnace and a stretch reducing mill. Operations at the Daingerfield plant were halted by

Digitized by Google

a 13-day strike beginning September 7. Over 3,000 plant workers were affected by the action.

**Motley.**—Building sand and building and paving gravel were prepared from open pits near Matador by Ellison & Thrasher and the Harris Sand Co.

**Nacogdoches.**—The Trawich (Rodessa) oilfield produced 9,000 barrels of crude oil. Nacogdoches County reported 18.9 billion cubic feet of natural gas produced during 1956. Two exploratory wells, totaling 15,760 feet, proved dry.

Miscellaneous clay used in heavy clay products was mined from open pits near Garrison by the Acme Brick Co.

**Navarro.**—The oil and gas industry produced 2.9 million barrels of crude oil from 11 oilfields, as well as 244 million cubic feet of natural gas during the year. Of 324 well completions, 34 were exploratory and 290 were development. Exploratory drilling totaled 82,829 feet, and all wells proved dry holes.

Miscellaneous clay used in heavy clay products was obtained from open pits near Corsicana by Whiteselle Brick-Lumber Co. Crushed limestone and paving gravel were produced for concrete aggregate and roadstone by Division 18 of the Texas Highway Department. Furnace slags from Daingerfield and El Paso were processed into rock wool for insulating purposes at a new Corsicana plant of American Rock Wool Corp.

**Newton.**—The oil and gas industry produced 1 million barrels of crude oil from 17 oilfields and 9.6 billion cubic feet of natural gas during the year. Of 16 exploratory well completions, totaling 132,622 feet, 1 was a new oil pay, 1 a new gas-condensate pay, 1 a gas discovery, and 13 were dry holes.

Miscellaneous stone was quarried and crushed for concrete and road metal for Division 20 of the Texas Highway Department.

**Nolan.**—Crude gypsum was mined from open pits near Sweetwater by the United States Gypsum Co. A multi-million-dollar gypsum-processing plant was being built near Sweetwater by Flintkote Co. The company planned to mine large gypsum deposits in the Sweetwater area and to manufacture plaster, wallboard, lath, and other gypsum products for the building industry.

Portland and masonry cements were produced by the Mary Neal plant of Lone Star Cement Corp. Limestone was quarried and crushed from pits near the plant for use in cement manufacture.

Building and paving sand and gravel were obtained from pits near Sweetwater by Hillsdale Gravel Co.

The oil and gas industry produced 8.7 million barrels of crude oil from 71 oilfields and 2 billion cubic feet of natural gas. Six gasoline plants recovered natural-gas liquids. The oil and gas industry drilled 70 exploratory and 258 development wells. Exploratory drilling totaled 457,133 feet, resulting in 4 oil discoveries, 5 new oil pays, and 60 dry holes.

**Nueces.**—Columbian Carbon Co. recovered carbon black at its Corpus Christi No. 56 channel plant. Natural-gas liquids were recovered at 7 gasoline and 6 cycling plants. Crude oil was processed at 6 refineries having a daily throughput capacity of 231,000 barrels; 7,000 barrels was shut down during 1956. Tennessee Gas Transmission Co. completed a fractionation plant near the Houston ship

Digitized by Google

channel and a 240-mile products pipeline. The new products line will permit movement of butane and other LP-gas products from the Banquete plant to the Butadiene plant of Petro-Tex Chemical Corp., and other petrochemical plants in the Houston area. Construction of a 15,000-barrel-per-day Rexformer unit at the Corpus Christi refinery of Suntide Refining Co. was begun. A Udex unit to separate aromatic and miscellaneous chemicals into upgraded octane gasolines was also being added to this new plant.

The oil and gas industry produced 16.2 million barrels of crude oil from 141 oilfields and 183.5 billion cubic feet of natural gas. The industry drilled 64 exploratory wells and 138 development wells during the year. Exploratory drilling totaled 436,657 feet, proving 4 oil discoveries, 15 new oil pays, 3 gas discoveries, 4 new gas pays, and 36 dry holes.

Portland and masonry cements were prepared from oystershell at the Corpus Christi plant of Halliburton Portland Cement Co. Oystershell was dredged from shallow inlets of Nueces Bay by General Dredging Co., Halliburton Portland Cement Co., Heldenfels Bros., Corpus Christi Shell Co., Inc., and Matagorda Shell Co. The principal uses of oystershell were in cement and lime, for road surfacing, and for railroad ballast. Lime used in industrial chemicals was prepared from oystershell by Columbia Southern Chemical Corp.

Barite from foreign countries and other States was crushed and ground for use in the production of heavy drilling muds by Baroid Division of National Lead Co. Building and paving sand and gravel were obtained from pits near Calallen by Heldenfels Bros.

**Ochiltree.**—The oil and gas industry produced 356,000 barrels of crude oil from 14 oilfields and 630 million cubic feet of natural gas in 1956. There were 111 well completions during the year, of which 43 were exploratory, and 68 development. Exploratory drilling totaled 362,059 feet, proving 8 oil discoveries, 3 new oil pays, 7 gas discoveries, 7 new gas pays, and 18 dry holes.

**Oldham.**—Approximately 443 million cubic feet of natural gas was produced in Oldham County in 1956.

Sand and gravel was recovered from pits near Tascosa by Western Aggregates, Inc., and from pits near Channing by Western Sand & Gravel Co. This commodity was used principally for building and paving purposes.

**Orange.**—Important expansions occurred in the mineral and petrochemical industries of Orange County in 1956. Firestone Tire & Rubber Co. began constructing a 40,000-ton butadiene plant and a 75,000-ton styrene plant at Orange. These commodities are essential ingredients of synthetic rubber and will be prepared from butane gas available in quantity in the area.

The oil and gas industry produced 3.9 million barrels of crude oil from 16 oilfields and 75.5 billion cubic feet of natural gas. Of 13 exploratory well completions totaling 109,577 feet, 1 proved an oil discovery and 12 wells were dry holes.

A 540,000-barrel-annual-capacity cement plant, utilizing oystershell as the basic material, was built at Orange by the Texas Portland Cement Co. Equipment consisted of a 300-foot rotary kiln and accessory grinding, processing, and conveying facilities incorporating many technical advances and innovations in the cement industry.

Digitized by Google

Miscellaneous stone used for concrete aggregate and roadstone was prepared for Division 20 of the Texas Highway Department.

**Palo Pinto.**—Miscellaneous clay, used in lightweight aggregate, floor and wall tile, and building brick and tile, was recovered from open pits near Strawn by the Featherlite Corp. and from pits near Mineral Wells by Texeramics Co. and Texas Vitrified Pipe Co.

Building and paving sand and gravel were obtained from pits near Mineral Wells by Mineral Wells Sand & Gravel Co.

Production of 240,000 barrels of crude oil from 10 oilfields and 1.6 billion cubic feet of natural gas was reported in 1956. Natural-gas liquids were recovered at the Gordon gasoline plant of Lone Star Gas Co. Of 45 well completions in 1956, 17 were exploratory wells, and 28 were development wells. Exploratory drilling totaled 43,243 feet; all wells were dry upon completion.

**Panola.**—Natural-gas liquids were recovered at the Carthage cycling plant of Lone Star Producing Co., the Panola gasoline plant of Arkansas Fuel Oil Corp., and the Carthage plants of the Carthage Co., the Arkansas Louisiana Gas Co., and the Chicago Corp. Production of 1.1 million barrels of crude oil from 19 oilfields and 539.7 billion cubic feet of natural gas was reported in the county. The oil and gas industry completed 163 wells, 6 of which were exploratory wells totaling 37,281 feet, resulting in 2 oil discoveries, 3 new oil pays, and 1 gas discovery.

**Parker.**—Six oilfields yielded 36,000 barrels of crude oil during the year. Natural-gas production amounted to 206 million cubic feet. Natural-gas liquids were recovered at the Springtown gasoline plant of Lone Star Gas Co. Of 12 exploratory well completions totaling 49,898 feet, 6 proved to be gas discoveries, and 6 wells were dry holes.

Miscellaneous clay used in heavy clay products was obtained from open pits near Bennett by Acme Brick Co. and Mineral Wells Clay Products Co. The Bennett plant was completely rebuilt by the company over a 5-year period, including new grinding facilities, 4 new rectangular suspended arch kilns, and renovation of 12 30-foot beehive kilns, increasing capacity to 125,000 brick equivalents a day.

**Pecos.**—Production of 17.2 million barrels of crude oil from 72 oilfields (2 of which produced more than 1 million barrels each) and 26.9 billion cubic feet of natural gas was reported. Natural-gas liquids were recovered at the McCandless gasoline plant of Bryce McCandless and at the Santa Rosa plant of The Pecos Co. There were 234 wells drilled in the county in 1956; 42 were exploratory wells and 192 were development wells. Exploratory drilling, totaling 239,808 feet, resulted in 1 oil discovery, 5 new oil pays, 1 gas discovery, 2 new gas pays, and 33 dry holes.

Gem stones, principally of the agate variety, were collected by hobbyists and dealers. Limestone was quarried and crushed for concrete aggregate and road stone for Division 6 of the Texas Highway Department.

Building and paving sand and gravel were recovered from pits near Imperial by F. M. Reeves & Sons, Inc.

**Polk.**—Production of 2 million barrels of crude oil from 15 oilfields and 5.6 billion cubic feet of natural gas was reported in the county. Natural-gas liquids were recovered at the Sunshine gasoline plant of

Digitized by Google

Sunshine Gasoline Co. The 3 exploratory well completions, totaling 14,679 feet, proved to be dry holes.

Limestone and miscellaneous stone were quarried and crushed for concrete aggregate and road stone for the Polk County Highway Department. Sand was recovered from pits near Corrigan by Texas Construction Material Co.

**Potter.**—Natural-gas liquids were recovered at the Fain and Turkey Creek gasoline plants of Amarillo Oil Co. Natural gas totaling 66.2 billion cubic feet was produced in Potter County. Crude-oil production amounted to 180 barrels. The Amarillo refinery of The Texas Co. processed crude oil during the year. No exploratory drilling by the oil and gas industry was reported in the county during the year.

Helium was produced at the Government-owned and operated Amarillo plant near Amarillo.

Building and paving sand and gravel were recovered from pits near Amarillo by Panhandle Gravel, Inc., and Texas Sand & Gravel Co.

**Presidio.**—Paving gravel was produced under contract for Division 24 of the Texas Highway Department.

Mercury was recovered from ores of the Terlingua mining district by Terlingua Mercury Corp. and Lone Star Mercury Co. Big Bend Mining Co., Inc., conducted a diamond-drilling program under a DMEA contract.

**Reagan.**—Natural-gas liquids were recovered at the Barnhart gasoline plant of Barnhart Hydrocarbon Corp., the Texon plant of Dorchester Corp., and the Midkiff plant of El Paso Natural Gas Co. The oil and gas industry produced 13.3 million barrels of crude oil from 25 oilfields, 3 of which yielded over 1 million barrels each, and 43.1 billion cubic feet of natural gas. The industry completed 200 wells—16 exploratory and 184 development. Exploratory drilling totaled 81,536 feet and resulted in 2 oil discoveries, 1 new oil pay, and 12 dry holes. Dorchester Corp.—a subsidiary of Oil and Gas Property Management, Inc.—purchased the 6 million-cubic-feet-per-day Big Lake gasoline plant of Texon Gas, Inc. The Northwest Production Corp., production subsidiary of Pacific Northwest Pipeline Corp., acquired the assets of Barnhart Hydrocarbon Corp.

**Red River.**—Three oilfields produced 10,000 barrels of crude oil in the county during 1956. The oil industry completed 22 exploratory wells totaling 47,848 feet, resulting in 2 oil discoveries and 20 dry holes.

**Reeves.**—Three oilfields yielded 348,000 barrels of crude oil during 1956. Natural-gas production amounted to 875 million cubic feet. Natural-gas liquids were recovered at the Tunstill gasoline plant of Pecos Petroleum Co. Of 17 exploratory well completions totaling 62,832 feet, 2 were oil discoveries and 15 wells were dry holes.

Building and paving sand and gravel were recovered from pits near Orla by Herman A. Lindley and from pits near Pecos by F. M. Reeves & Sons, Inc.

**Refugio.**—Natural-gas liquids were recovered at the AGSCO gasoline plant of AGSCO Minerals Corp. and the Tom O'Connor plant of Humble Oil & Refining Co. The oil and gas industry produced 20.6 million barrels of crude oil from 59 oilfields (3 fields produced over 1 million barrels each) and 175.4 billion cubic feet of natural gas. The oil and gas industry completed 104 wells; 18 were exploratory wells, and 92 were development wells. Exploratory

Digitized by Google

drilling totaled 126,733 feet, resulting in 1 oil discovery, 4 new oil pays, 1 new oil-gas pay, 4 new gas pays, and 8 dry holes.

**Roberts.**—Three oilfields yielded 1.6 million barrels of crude oil during the year. Natural-gas production amounted to 5.1 billion cubic feet. Of 14 exploratory well completions totaling 92,538 feet, 2 proved oil discoveries and 1 a gas discovery; 11 were dry holes.

**Robertson.**—Sand and gravel for building and paving purposes was recovered from pits near Hearne by Gifford-Hill & Co., Inc. One oilfield yielded 21,000 barrels of crude oil during the year. Natural-gas production amounted to 188 million cubic feet.

**Runnels.**—Natural-gas liquids were recovered at the Runnels gasoline plant of Gulf Oil Corp., the Fort Chadbourne plant of Lone Star Producing Co., and the Sykes plant of Runnels Gas Products Corp. Production of 5.4 million barrels of crude oil from 145 oilfields and 5.8 billion cubic feet of natural gas was reported. The oil and gas industry completed 231 wells—84 exploratory and 147 development. Exploratory drilling totaled 331,099 feet, proving 6 oil discoveries, 14 new oil pays, 1 gas discovery, and 63 dry holes.

**Rusk.**—Rusk County was the seventh ranking mineral producing county in value in 1956, with a total of $85.4 million. Eight oilfields yielded 29 million barrels of crude oil during the year. Natural-gas production amounted to 29.3 billion cubic feet. Natural-gas liquids were recovered at the Cashen gasoline plant of Gulf Oil Corp., the East Texas plant of Humble Oil & Refining Co., the Giles plant of the Parade Co., and Plants 19 and 21 of Sinclair Oil & Gas Co. Of 16 exploratory well completions totaling 77,750 feet, 1 proved an oil discovery, 2 were gas discoveries, and 13 were dry holes.

Miscellaneous clay, used in heavy clay products, was recovered from pits near Henderson by J. M. Cordell & Sons, Inc., and Major Brick Co. Fire clay, also used in heavy clay products, was recovered from pits by the Henderson Clay Products, Inc.

**San Jacinto.**—Seven oilfields in San Jacinto County yielded 531,000 barrels of crude oil. Production of 10.1 billion cubic feet of natural gas was reported. Natural-gas liquids were recovered at the Plymouth cycling plant of Plymouth Oil Co. Exploratory drilling totaling 25,823 feet resulted in 3 dry holes upon completion.

Sand and gravel for building and paving purposes was dredged from pits near Shepherd by Thorstenberg & Tamborello.

**San Patricio.**—Natural-gas liquids were recovered at Red Fish Bay gasoline plant of Sunray Mid-Continent Oil Co. and Plant No. 20 of Sinclair Oil & Gas Co. Production of 16.9 million barrels of crude oil from 125 oilfields (3 of which produced over 1 million barrels each) and 45.7 billion cubic feet of natural gas was reported during the year. The oil and gas industry completed 50 exploratory wells and 153 development wells. Exploratory drilling totaled 334,351 feet, resulting in proving 7 oil discoveries, 10 new oil pays, 1 gas discovery, 6 new gas pays, and 26 dry holes.

Limestone was quarried and crushed near Mathis for concrete and roadstone by Heldenfels Bros. Sand and gravel was recovered by Fordyce Gravel Co.

Reynolds Metals Co. operated its San Patricio reduction works and its La Quinta alumina plant near Corpus Christi during the year. A strike, which idled these operations for 26 days, was settled by agree-

Digitized by Google

ment, resulting in a 3-year contract. The expansion program at the La Quinta alumina plant was to result in a 50-percent capacity increase—from 365,000 tons to 548,000 tons of alumina per year.

**Schleicher.**—The oil and gas industry produced 3.5 million barrels of crude oil from 17 oilfields and 1.6 billion cubic feet of natural gas. Of 47 well completions, 21 were exploratory and 26 development. Exploratory drilling totaled 121,003 feet, proving 1 oil discovery and 1 oil extension; 19 wells were dry holes.

A new gas-products plant to process 140 million cubic feet of gas a month, from which more than 1.6 million gallons of natural gasoline, butane, and propane will be recovered, was built in the Hilldale field 12 miles northeast of El Dorado by Sinclair Oil & Gas Co. and Skelly Oil Co.

**Scurry.**—Scurry County ranked fifth in total mineral value in 1956 (with a total value of $129.4 million) and fourth in crude-oil production. The oil and gas industry produced 44.4 million barrels of crude oil from 45 oilfields, 6 of which yielded more than 1 million barrels of crude each, and 49.8 billion cubic feet of natural gas. Natural-gas liquids were recovered at the Diamond "M" gasoline plant of Lion Oil Co., the North Snyder plant of Standard Oil Co. of Texas, the Snyder plant of Sunray Oil Corp., and the Fuller plant of The Texas Co. The oil and gas industry completed 296 wells, 23 were exploratory wells and 273 were development wells. Exploratory drilling, totaling 122,724 feet, proved 7 oil wells, and 16 wells were dry holes.

Building and paving sand and gravel were produced by the Ira Sand & Gravel Co.

**Shackelford.**—Natural-gas liquids were recovered at the No. 1 gasoline plant of Marshall R. Young and at the Graridge No. 1 plant of Graridge Corp. The oil and gas industry completed 402 wells, 75 were exploratory wells, and 327 were development wells. Exploratory drilling totaled 201,886 feet, resulting in 14 oil discoveries, 2 new oil pays, 1 gas discovery, 1 new gas pay, and 57 dry holes.

Building sand and gravel was produced from pits near Albany by Taylor Bros.

**Shelby.**—The oil and gas industry produced 9,000 barrels of crude oil from 3 oilfields and 24.2 billion cubic feet of natural gas during 1956. Of 9 exploratory well completions totaling 49,759 feet, 1 proved a new gas pay, and 8 were dry holes.

**Sherman.**—Four oilfields yielded 15,000 barrels of crude oil during the year. Natural-gas production amounted to 133.2 billion cubic feet. Of 14 wells drilled by the oil and gas industry, 3 were exploratory wells totaling 22,121 feet, resulting in 1 oil discovery and 2 dry holes.

**Smith.**—Natural-gas liquids were recovered at the Chapel Hill gasoline plant of Etexas Producers Gas Co. and the Chapel Hill cycling plant of Lone Star Producing Co. The oil and gas industry produced 1.6 million barrels of crude oil from 15 oilfields and 8 billion cubic feet of natural gas during the year. Crude oil was processed at the Tyler refinery of McMurray Refining Corp. Of 19 exploratory well completions by the oil and gas industry totaling 115,757, 1 was an oil discovery, and 18 were dry holes.

Sand was produced from open pits near Tyler by H. J. Ellis.

465877—58——71

Digitized by Google

**Starr.**—Production of 7.3 million barrels of crude oil from 89 oilfields and 18.3 billion cubic feet of natural gas was reported in Starr County in 1956. Natural-gas liquids were recovered at the Rincon gasoline plant of Continental Oil Co. and at the Sun plant of the Sun Oil Co. The oil and gas industry completed 210 wells; 61 exploratory wells and 149 development wells. Exploratory drilling totaled 238,386 feet, resulting in 7 oil discoveries, 4 new oil pays, 6 gas discoveries, 2 new gas pays, and 42 dry holes.

Pumicite was mined from open pits by Pozzolana, Inc. Building and paving sand and gravel were produced by Fordyce Gravel Co. Miscellaneous clay, to be used in heavy clay products, was mined from open pits by Valley Brick & Tile Co.

**Stephens.**—The oil and gas industry produced 3.6 million barrels of crude oil from 96 oilfields and 10.2 billion cubic feet of natural gas during 1956. Natural-gas liquids were recovered at the Eliasville gasoline plant of Breckenridge Gasoline Co., the Brooks plant of Lone Star Production Co., the Caddo plant of Texas Pacific Coal & Oil Co., and the No. 30 plant of Warren Petroleum Corp. The oil and gas industry completed 247 wells in 1956, 63 exploratory wells and 184 development wells. Exploratory drilling totaled 244,699 feet resulting in 13 oil discoveries, 12 new oil pays, 2 gas discoveries, 2 new gas pays, and 34 dry holes.

**Sterling.**—Thirteen oilfields yielded 898,000 barrels of crude oil during 1956. Natural-gas production amounted to 6 million cubic feet. Of 19 exploratory wells completed (totaling 79,338 feet), 1 was an oil discovery, 1 an oil extension, and 17 were dry holes.

**Stonewall.**—Natural-gas liquids were recovered at the Stonewall gasoline plant of Liquigas Co. The oil and gas industry produced 10.7 million barrels of crude oil from 73 oilfields (3 fields producing more than 1 million barrels each) and 3 billion cubic feet of natural gas during the year. The industry completed 144 wells; 45 were exploratory and 99 development. Exploratory drilling totaled 258,132 feet, proving 5 oil discoveries, 4 new oil pays, 1 oil extension, and 35 dry holes.

Building and paving sand and gravel were recovered from open pits by Hamlin Sand & Gravel Co., Inc.

**Sutton.**—Two oilfields yielded 14,000 barrels of crude oil in 1956. There were 5.1 billion cubic feet of natural gas produced in the county. Exploratory drilling totaled 32,159 feet, resulting in 1 gas discovery and 6 dry holes.

**Swisher.**—Division 25 of the Texas Highway Department acquired crushed limestone for concrete aggregate and roadstone purposes.

One exploratory well, drilled to a depth of 9,343 feet, proved dry when completed.

**Tarrant.**—Crude oil was processed at the Fort Worth refinery of Premier Oil Refining Co. of Texas.

Portland and masonry cements were produced at the Fort Worth plant of General Portland Cement Co. An expansion program, which increased the plant's production capacity 1.25 million barrels to a total of 3.25 million barrels, included installation of a third kiln, and grinding and auxiliary equipment required for the expanded output.

Digitized by Google

Mica was ground and prepared at the Fort Worth plant of Western Mica Co. Finished architectural limestone was prepared by Carruthers Cutstone Co.

Sand and gravel, used principally for building and paving purposes and for railroad ballast, was recovered from open pits in Tarrant County by 12 producers.

**Taylor.**—Production of 2.9 million barrels of crude oil from 106 oilfields and 138 million cubic feet of natural gas was reported in 1956. Crude oil was processed at the Abilene refinery of Monarch Refining Co. Natural-gas liquids were recovered at the Eskota gasoline plant of Otha H. Grimes. The oil and gas industry completed 359 wells in 1956; 124 were exploratory wells, and 235 were development wells. Exploratory drilling, totaling 402,680 feet, resulted in proving 15 oil discoveries, 12 new oil pays, and 97 wells were dry.

Limestone was quarried and crushed from pits near View for concrete aggregate and roadstone by H. B. Zachry Co. Miscellaneous clay was mined from open pits for use in the manufacture of heavy clay products by Abilene Brick Co.

Sand and gravel was recovered from pits near Merkel by Atlas Sand & Gravel Co. and from pits near Abilene by Caton Sand & Gravel Co. The principal use was for building purposes with lesser quantities used as glass sand.

**Terrell.**—Limestone was quarried and crushed for concrete aggregate and roadstone for Division 6 of the Texas Highway Department.

The oil and gas industry completed 2 exploratory wells totaling 4,902 feet; both wells were dry holes.

**Terry.**—Production of 7.8 million barrels of crude oil from 19 oilfields and 424 million cubic feet of natural gas was reported in Terry County in 1956. Of 8 exploratory well completions totaling 64,204 feet, 2 proved oil discoveries and 6 were dry holes.

Carbon black was recovered at the Seagraves No. 64 furnace plant of Columbian Carbon Co.

**Throckmorton.**—Production from 114 oilfields in Throckmorton County amounted to 3.6 million barrels of crude oil. Natural-gas production amounted to 365 million cubic feet. The oil and gas industry completed 156 wells during the year; 69 were exploratory wells totaling 241,230 feet, and 87 were development wells. Exploratory drilling proved 10 oil discoveries, 2 new oil pays, and 57 dry holes.

**Titus.**—Three oilfields (1 of which produced over 1 million barrels) yielded 4.2 million barrels of crude oil in 1956. Crude oil was processed at the 16,500-barrel-per-day Mount Pleasant refinery acquired by American Petrofina from American Liberty Oil Co. of Texas late in the year. Natural-gas production amounted to 18 million cubic feet. Six exploratory wells were completed totaling 37,741 feet; 1 proved to be a dual oil discovery and 5 were dry holes.

**Tom Green.**—Building gravel was prepared from pits near San Angelo by Vernon Vines.

Production of 2.4 million barrels of crude oil from 38 oilfields and 116 million cubic feet of natural gas was reported during the year. Of 67 exploratory wells completed by the oil and gas industry (totaling 328,930 feet), 3 proved oil discoveries, 1 a new oil pay, 1 a gas dis-

Digitized by Google

covery, 1 a new gas pay, and 61 wells were dry holes. There were 73 development wells completed during the year.

**Travis.**—Three oilfields yielded 55,000 barrels of crude oil in 1956. The oil industry drilled 55 wells, 30 exploratory wells totaling 26,178 feet, and 25 development wells. All exploratory wells proved dry upon completion.

Lime was prepared from limestone and sold for building, chemical, and industrial purposes by Austin White Lime Co. Grinding pebbles and marble were obtained from open pits near Austin by Dezendorf Marble Co. Rough and finished architectural dimension limestone was quarried and prepared by Austin Stone Industries and Texas Quarries, Inc. Limestone was quarried and crushed for concrete aggregate, roadstone, and refractory purposes by Border Construction Co. and Texas Crushed Stone Co.

Building and paving sand and gravel were obtained from pits near Austin by Austin Sand & Gravel Co. and R. E. Janes Gravel Co., Inc.

**Trinity.**—Production of 191 million cubic feet of natural gas was reported from Trinity County in 1956. No drilling was reported by either the oil or the gas industry during the year.

**Tyler.**—Natural-gas liquids were recovered at gasoline Plant No. 24 of Sinclair Oil & Gas Co. Production of 691,000 barrels of crude oil from 18 oilfields and 7.1 billion cubic feet of natural gas was produced in Tyler County in 1956. Of 5 exploratory wells totaling 47,755 feet, 1 proved an oil discovery, 1 a new oil pay, and 3 were dry holes. Seven development wells were completed during the year.

Miscellaneous stone was quarried and crushed for concrete aggregate and roadstone for Division 20 of the Texas Highway Department. The Coastal Tiles Co., Inc., started operating its wall and ceramic trim tile plant at Woodville during the year. The plant can produce 100,000 square feet of tile a month.

**Upshur.**—Most of the 3.1 million barrels of crude oil produced in Upshur County came from the prolific East Texas oilfield, which also encompasses Gregg and Cherokee Counties; also 2.5 billion cubic feet of natural gas was produced during the year. Five exploratory wells totaling 17,550 feet proved dry upon completion.

Building, molding, and engine sands were recovered from open pits near Big Sandy by the Big Sandy Sand & Gravel Co.

**Upton.**—The oil and gas industry completed 350 wells; 37 were exploratory and 313 development. Exploratory drilling totaled 276,017 feet, proving 6 oil discoveries, 13 new oil pays, 1 oil extension, and 17 dry holes. The oil and gas industry produced 16 million barrels of crude oil from 61 oilfields (3 of which produced over 1 million barrels each) and 50.4 billion cubic feet of natural gas.

Natural-gas liquids were recovered at the Benedum gasoline plants of Texas Gas Products Corp., and of Pecos Co., the Pembrook plant of Phillips Petroleum Co., and the McElroy-Wilshire plant of Lone Star Producing Co.

Limestone was quarried and crushed for concrete aggregate and road stone for Division 6 of the Texas Highway Department.

**Uvalde.**—Native asphalt for road material and surfacing was quarried and prepared from pits near Blewett by Uvalde Rock Asphalt Co. and from pits near Dabney by Whites Uvalde Mines. Miscel-

Digitized by Google

laneous stone was quarried and crushed from pits for use as concrete aggregate and road stone by Southwest Stone Co.

**Van Zandt.**—Natural-gas liquids were recovered at the Van gasoline plant of Pure Oil Co. Three oilfields (1 of which produced more than 1 million barrels of crude oil), yielded 9.3 million barrels of crude oil during 1956. Natural-gas production amounted to 4 billion cubic feet. The oil and gas industry completed 65 wells, 13 exploratory wells totaling 57,607 feet and 52 development wells. All exploratory wells proved dry upon completion.

The Morton Salt Co. recovered salt from mines and from wells near Grand Saline. The salt was processed in both open and vacuum pans into pressed blocks and rock salt.

**Victoria.**—The oil and gas industry produced 7.1 million barrels of crude oil from 49 oilfields and 105 billion cubic feet of natural gas in Victoria County in 1956. There were 74 wells completed by the oil and gas industry during 1956, 18 of which were exploratory wells totaling 122,747 feet, and 56 were development wells. Exploratory drilling proved 1 oil discovery, 4 new oil pays, 1 gas discovery, 1 new gas pay, and 11 dry holes.

Building and paving sand and gravel were produced from pits by the Fordyce Gravel Co. and by Heldenfels Bros.

**Walker.**—Bentonitic clay was recovered from open pits near Riverside by the Milwhite Co., Inc. The Sam Houston field in Walker County produced 9,000 barrels of crude oil.

**Waller.**—Natural-gas liquids were recovered at the Katy cycling plant of Humble Oil & Refining Co. The oil and gas industry produced 437,000 barrels of crude oil from 4 oilfields and 361 million cubic feet of natural gas during the year. The 5 exploratory wells, totaling 35,495 feet, all proved dry upon completion.

Paving gravel was produced for Division 12 of the Texas Highway Department and for the Waller County Road and Bridge Department.

**Ward.**—In all, 11.9 million barrels of crude oil was produced from 37 oilfields (1 of which yielded over 1 million barrels) and 20.4 billion cubic feet of natural gas was reported in Ward County in 1956. The Wickett Refining Co. processed crude oil at its Wickett refinery. Natural-gas liquids were recovered at the Sealy-Smith gasoline plant of El Paso Natural Gas Co., the Monahans plant of Gulf Oil Corp., and the Estes plant of Cabot Carbon Co. The oil and gas industry completed 282 wells in 1956, 19 exploratory wells totaling 11,290 feet and 263 development wells. Exploratory drilling proved 1 oil discovery, 1 new gas pay, and 17 dry holes.

Natural sodium sulfate was recovered and prepared from salt wells and dry lake brines near Monahans by Ozark Mahoning Co.

Building and paving sand and gravel were recovered from pits near Royalty by Permian Sand & Gravel Co., Inc. Limestone was quarried and crushed under contract for concrete aggregate and roadstone for Division 6 of the Texas Highway Department.

**Washington.**—Five oilfields yielded 304,000 barrels of crude oil in 1956, and 24 million cubic feet of natural gas was produced during the year. The oil and gas industry completed 3 wells, 1 exploratory well drilled to a depth of 7,659 feet proved dry.

**Webb.**—Gravel used for railroad ballast was produced from pits by Laredo Ready Mix Corp. Miscellaneous clay used in heavy clay

Digitized by Google

products was recovered from open pits near Laredo by E. C. Delachica Clay Co.

Production of 2 million barrels of crude oil from 46 oilfields and 58 million cubic feet of natural gas was reported in the county in 1956. There were 94 well completions, 27 exploratory and 67 development. Exploratory drilling totaling 97,566 feet resulted in 2 oil discoveries, 1 new oil pay, 1 gas extension, and 23 dry holes.

**Wharton.**—Natural-gas liquids were recovered at the West Bernard gasoline plant of Tide Water Oil Co. The oil and gas industry produced 7.1 million barrels of crude oil from 37 oilfields (2 of which produced more than 1 million barrels each) and 97.4 billion cubic feet of natural gas in 1956. Of 106 well completions in 1956, 38 wells totaling 241,352 feet were exploratory, and 68 were development wells. Exploratory drilling proved 1 oil discovery, 1 gas discovery, 2 new gas pays, and 34 dry holes.

Native sulfur was recovered by the Frasch process from Boling dome at New Gulf by Texas Gulf Sulphur Co.

**Wheeler.**—Carbon black was recovered at the Norrick furnace plant of United Carbon Co., Inc.

Natural-gas liquids were recovered at the McLean-28 gasoline plant of Warren Petroleum Corp.

Two oilfields, with the Wheeler County field producing more than 1 million barrels alone, yielded 1.4 million barrels of crude oil during 1956. Natural-gas production amounted to 13.1 billion cubic feet during the year. The oil and gas industry completed 2 exploratory wells totaling 11,500 feet; both were dry holes.

Limestone was quarried and crushed under contract for concrete aggregate and roadstone for Division 25 of the Texas Highway Department.

**Wichita.**—In all, 11.2 million barrels of crude oil was produced from 41 oilfields (2 of which yielded more than 1 million barrels of crude each) and 7.7 billion cubic feet of natural gas was produced in Wichita County in 1956. Natural-gas liquids were recovered at the Burkburnett gasoline plant of Magnolia Petroleum Co., the Electra plant of The Texas Co., the K. M. A. plant of Continental Oil Co., and the Mankins plant of Redco Corp. Crude oil was refined at the Wichita Falls refineries of American Petrofina, Inc., and Continental Oil Co. The oil and gas industry drilled 768 wells in 1956, of which 28 were exploratory wells totaling 94,959 feet and 740 were development wells. Exploratory drilling proved 2 oil discoveries, 1 new oil pay, 3 oil extensions, and 22 dry holes. A $750,000 Platformer unit to increase the high octane gasoline output to 6.5 million gallons a month was installed at the Wichita refinery of Panhandle Oil Corp. This unit increased the refinery's throughput from 7,000 to 8,000 barrels per day.

Building and paving sand and gravel were recovered from open pits by Foley Sand & Gravel Co., Gravel, Inc., and Northwest Materials Co. Miscellaneous stone and limestone were quarried and crushed under contract for Division 3 of the Texas Highway Department.

**Wilbarger.**—Natural-gas liquids were recovered at the Rock Crossing gasoline plant of the W. T. Waggoner Estate and the Electra plant of Magnolia Petroleum Co. Production of 5.7 million barrels of crude oil from 56 oilfields and 676 million cubic feet of natural gas

Digitized by Google

was reported in the county. The oil and gas industry completed 540 wells, 88 were exploratory wells totaling 311,083 feet, and 452 were development wells. Exploratory drilling proved 7 oil discoveries, 1 new oil pay, 3 oil extensions, and 77 dry holes.

**Willacy.**—The oil and gas industry produced 3.1 million barrels of crude oil from 19 oilfields and 5.3 billion cubic feet of natural gas during 1956. There were 30 wells completed during the year, 6 were exploratory wells totaling 53,408 feet, and 24 were development wells. Exploratory drilling proved 2 new oil pays and 4 dry holes.

**Williamson.**—Five oilfields yielded 45,000 barrels of crude oil in 1956. Natural-gas production amounted to 3 million cubic feet. There were 19 exploratory wells totaling 24,905 feet drilled in 1956; all proved dry upon completion.

The Round Rock White Lime Co. manufactured lime from limestone for use as building plaster and for chemical and industrial uses. Building and paving sand and gravel were produced by E. G. John. Limestone was quarried and crushed from pits near Round Rock by Round Rock White Lime Co., Superior Stone Products, Inc., from pits near Florence by Texas Carbonate Co., and from pits near Cedar Park by Texas Quarries, Inc. Principal uses of the crushed stone were for concrete aggregate, roadstone, refractory purposes, and in the manufacture of lime. Rough architectural stone was quarried and prepared from a pit near Cedar Park by Texas Quarries, Inc.

**Wilson.**—The W. S. Dickey Clay Manufacturing Co. recovered fire clay for heavy clay products from pits near Saspamco.

The oil and gas industry produced 826,000 barrels of crude oil from 19 oilfields and 33 million cubic feet of natural gas during 1956. Of 293 well completions during the year, 94 were exploratory wells totaling 262,291 feet, and 199 were development wells. Exploratory drilling proved 3 oil discoveries, 1 new oil pay, 12 oil extensions, and 78 dry holes.

**Winkler.**—Carbon black was recovered at the Kermit channel plant of Cabot Carbon Co. Natural-gas liquids were recovered at the Kermit gasoline plant of Magnolia Petroleum Co., the Rycade plant of Rycade Oil Corp., the Walton plant of Cabot Carbon Co., and the Keystone plant of Sid Richardson Gasoline Co. (elemental sulfur also was recovered at this plant).

There were 16.3 million barrels of crude oil from 38 oilfields (4 of which produced over 1 million barrels each) and 45.3 billion cubic feet of natural gas produced during the year. The oil and gas industry completed 173 wells, 16 were exploratory wells totaling 132,351 feet, and 157 were development wells. Exploratory drilling proved 1 oil discovery, 3 new oil pays, 1 oil extension, 3 new gas pays, 1 gas extension, and 7 dry holes.

**Wise.**—Limestone was quarried and crushed and used principally for concrete aggregate, roadstone, riprap, and as agricultural lime, near Bridgeport by Ft. Worth Sand & Gravel Co., Gifford-Hill & Co., Inc., Southwest Stone Co., and Wesco Stone Co. Miscellaneous clay or shale was mined from pits near Bridgeport for use in the manufacture of heavy clay products by Acme Brick Co. Paving gravel was produced under contract for Division 2 of the Texas Highway Department.

Digitized by Google

Natural-gas liquids were recovered at the Atlanta gasoline plant of Atlanta Gas Co. and the Chico plant of Cities Service Oil Co. The oil and gas industry produced 1.6 million barrels of crude oil from 62 oilfields and 7.3 billion cubic feet of natural gas during 1956. Of 180 well completions during 1956, 36 were exploratory wells totaling 209,991 feet, and 144 were development wells. Exploratory drilling proved 7 oil discoveries, 12 new oil pays, 2 oil extensions, 6 gas discoveries, and 9 dry holes.

**Wood.**—The oil and gas industry produced 23.3 million barrels of crude oil from 37 oilfields and 16 billion cubic feet of natural gas during 1956. The industry completed 48 wells; 19 were exploratory wells totaling 137,714 feet, and 29 were development wells. Exploratory drilling proved 1 oil discovery, 1 new oil pay, and 17 dry holes. Natural-gas liquids were recovered at the Caska gasoline plant of Caska Corp. and the Hawkins plant of Natural Gasoline Corp.

**Yoakum.**—Natural-gas liquids were recovered at the Wasson gasoline plant of Shell Oil Co. Production of 19.8 million barrels of crude oil from 25 oilfields (3 of which produced over 1 million barrels each) and 19 billion cubic feet of natural gas was reported in the county. There were 87 well completions in 1956; 13 were exploratory wells totaling 126,214 feet, and 74 were development wells. Exploratory drilling proved 2 oil discoveries, 1 new oil pay, and 10 dry holes.

Salt in brine was recovered from wells near Denver City by Frontier Chemical Co.

**Young.**—The oil and gas industry produced 7.6 million barrels of crude oil from 193 oilfields and 3.1 billion cubic feet of natural gas during 1956. Natural-gas liquids were recovered at the Le Bus gasoline plant of Le Bus Bros., and the Loving and Peters plants of Turner & West Gasoline Plant. Crude oil was processed at the Graham refinery of Gratex Corp. The oil and gas industry completed 689 wells; 150 were exploratory wells totaling 602,481 feet, and 539 were development wells. Exploratory drilling proved 22 oil discoveries, 13 new oil pays, 3 oil extensions, and 112 dry holes.

**Zapata.**—Twelve oilfields yielded 1.2 million barrels of crude oil during 1956. Natural-gas production amounted to 785 million cubic feet. Of 87 well completions during 1956, 33 were exploratory wells totaling 83,917 feet, and 54 were development wells. Exploratory drilling proved 2 oil discoveries, 1 gas discovery, 1 gas extension, and 29 dry holes.

**Zavala.**—Building and paving sand and gravel were recovered from pits near Uvalde by D & D Gravel Co.

Crude oil was produced from the Del Monte oilfield in Zavala County. Natural-gas production amounted to 876 million cubic feet during the year. Exploratory drilling in the oil and gas industry totaled 46,346 feet, proving 1 gas extension and 12 dry holes.

Digitized by Google

# The Mineral Industry of Utah

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Utah Geological and Mineralogical Survey.

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker[1]

THE MINERAL industries continued to play a major role in the overall economy of Utah in 1956; new construction and expansion of plants and facilities related to these industries, begun or completed in 1956, aggregated an investment that exceedes $100 million.

The copper industry, dominating the mineral industries of the State, centered in the Salt Lake City area, embracing Salt Lake and Tooele Counties; this area continued to be one of the most important single mineral producing, milling, processing, smelting, and refining districts in the United States. The Utah Copper mine at Bingham in this area was the Nation's leading copper producer and furnished one-quarter of the entire domestic output. Molybdenum, produced as a byproduct of copper ore from this mine, was another of Utah's major mineral-commodity products. Iron-ore mining in Iron County continued to be an important component of State mineral industries.

Discovery of oil in the Aneth area, southeastern San Juan County, was the most significant development in the fuels industry and very important to the overall mineral industry of Utah in 1956. It started a drilling boom that led to development of substantial oil reserves in the Paradox basin and brought about the announcement of three pipeline projects, to Salt Lake City, to Los Angeles, and to connect with the crude-oil line system in eastern New Mexico and western Texas.

The total value of the mineral production in Utah rose from $331.9 million excluding uranium in 1955 to a new alltime record of $397.1 million including uranium in 1956. This 20-percent increase ($65.2 million) resulted mainly from a 23-percent advance ($39.2 million) in the value of copper output, which composed 54 percent ($213.0 million) of the total value of mineral output in the State in 1956. In terms of value of output by commodities, coal ranked second, supplied 8 percent of the total value of mineral production, and declined 14 percent ($5.6 million). The value of iron-ore shipments, which ranked third and

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.



Digitized by Google

## TABLE 1.—Mineral production in Utah 1955–56 [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Asphalt and related bitumens: Gilsonite | 82,822 | $3,117,310 | (2) | (2) |
| Clays | (2) | (2) | [3] 226,728 | [3] $491,789 |
| Coal | 6,295,524 | 40,006,140 | 6,522,164 | 34,436,090 |
| Copper (recoverable content of ores, etc.) | 232,949 | 173,779,954 | 250,604 | 213,013,400 |
| Fluorspar | 7,328 | 151,140 | 10,581 | 265,449 |
| Gem stones | (4) | 6,000 | (4) | 10,000 |
| Gold (recoverable content of ores, etc.)—troy ounces | 441,206 | 15,442,210 | 416,031 | 14,561,085 |
| Iron ore (usable)—long tons, gross weight | 3,847,402 | 24,687,485 | 4,001,739 | 27,908,060 |
| Lead (recoverable content of ores, etc.) | 50,452 | 15,034,696 | 49,555 | 15,760,270 |
| Lime | 38,710 | 582,760 | 55,110 | 829,772 |
| Natural gas—million cubic feet | 17,163 | 2,386,000 | 17,268 | 2,435,000 |
| Perlite | (2) | (2) | 2,271 | 8,515 |
| Petroleum (crude)—thousand 42-gallon barrels | 2,227 | 5,140,000 | 2,466 | 5,302,000 |
| Phosphate rock—long tons | (2) | (2) | 124,773 | 771,765 |
| Pumice | 2,041 | 20,011 | 44,769 | 329,603 |
| Salt | 195,726 | 1,339,085 | 183,701 | 1,471,080 |
| Sand and gravel | 5,158,265 | 3,309,280 | 5,835,500 | 4,475,700 |
| Silver (recoverable content of ores, etc.)—troy ounces | 6,250,565 | 5,657,077 | 6,572,041 | 5,948,029 |
| Stone | 1,925,867 | 2,650,480 | 2,321,636 | 3,298,006 |
| Tungsten concentrate—60-percent $WO_3$ basis | 65 | 224,742 | 11 | 41,200 |
| Uranium ore | (5) | (5) | 927,850 | 22,500,000 |
| Vanadium (recoverable content of ores, etc.)—pounds | 995,873 | (3) | 1,098,802 | (3) |
| Zinc (recoverable content of ores, etc.) | 43,556 | 10,714,776 | 42,374 | 11,610,476 |
| Value of items that cannot be disclosed: Carbon-dioxide (natural), cement, halloysite (1956), gypsum, molybdenum, natural gasoline, potash ($K_2O$), and values indicated by footnote 2 | | 28,733,292 | | 33,230,179 |
| Total Utah [6] | | [6] 331,929,000 | | 396,942,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration purchase depots ore is excluded.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[3] Excludes halloysite; value included with items that cannot be disclosed to avoid disclosing individual company confidential data.
[4] Weight not recorded.
[5] Excludes uranium; uranium figure for 1955 not released by Atomic Energy Commission.
[6] Total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.

## TABLE 2.—Average unit value of selected mineral commodities in Utah, 1955–56 [1]

| Commodity | 1955 | 1956 | Commodity | 1955 | 1956 |
|---|---|---|---|---|---|
| Coal—short ton | $6.355 | $5.280 | Petroleum (crude) [4] 42-gallon barrel | $2.308 | $2.150 |
| Copper [2]—pound | .373 | .425 | Pumice—short ton | 9.805 | 7.362 |
| Fluorspar—short ton | 20.625 | 25.087 | Salt (common)—do | 6.842 | 8.008 |
| Gold [3]—troy ounce | 35.000 | 35.000 | Sand and gravel—do | .642 | .767 |
| Iron ore (usable)—long ton | 6.417 | 6.874 | Silver [5]—troy ounce | .905+ | .905+ |
| Lead [2]—pound | .149 | .157 | Stone—short ton | 1.376 | 1.421 |
| Lime—short ton | 15.055 | 15.057 | Tungsten concentrate short-ton unit | 58.028 | 60.614 |
| Natural gas thousand cubic feet | .139 | .141 | Zinc [2]—pound | .123 | .127 |

[1] Based on average value f. o. b. mines or mills reported by the producers except as otherwise noted.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Value at wells.
[5] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505.

Digitized by Google

was responsible for 7 percent of the total, increased 11 percent ($2.8 million). Other major commodities, accounting for 27 percent of the total, in order of value of output, included uranium, molybdenum, lead, gold, zinc, cement, silver, petroleum, sand and gravel, and asphalt and related bitumens. Sixteen other commodities furnished the remaining 4 percent of the total value of mineral production in the State in 1956.

Arsenic, selenium, tellurium, platinum, palladium, thallium, and other minor metals were recovered at smelters and refineries in Utah in 1956. It is known that some of the output of these minerals came from Utah ores, but the exact quantities are not known because some came from ores of other States and foreign countries. In most instances the content of these minerals is small in the ore, is not accounted for in the early metallurgical processing, and is not credited to the mine of origin. For these reasons, no production of these minerals was recorded for Utah in 1956.

**Employment and Wages.**—The Industrial Commission of Utah reported [2] that individuals in Utah in 1956 received $1,326 million in personal income—an amount equivalent to $1,633 for every man, woman, and child in the State. Wages and salaries made up 71 percent ($942 million) of this total amount. Two-thirds ($622 million) of the income arising through wages and salaries originated with industries covered by the Utah Employment Security Act. Of this amount, $81 million (6.1 percent of the total personal income for Utah) was paid to employees engaged in mining.

Data in this section are from a report [3] by the United States Department of Labor. The term "mining," as used in the tables, does not cover the entire employment in the mineral industries. Some employment in the mineral industries was included with contract construction because separate records were not kept by the firms for mining, quarrying, and removal of overburden. In addition, employment for smelting and refining ferrous and nonferrous metals from ores—an integral part of the mineral industries—was included with manufacturing. (Manufacturing has been excluded from table 3.)

The annual average employment in the mining industries in Utah was 6.6 percent of the total nonagricultural employment in 1956, compared with 6.3 percent in 1955. The average hourly earnings in Utah mining increased during the year from $2.26 in January to $2.44 in December. The average weekly hours were steady throughout the year in metal mining, but in bituminous-coal mining the average varied from a low of 31.9 hours in July to a high of 39.4 hours in December, following the usual seasonal pattern.

[2] The Industrial Commission of Utah, Department of Employment Security, Annual Report, 1956: 49 pp.
[3] U. S. Department of Labor, Bureau of Labor Statistics, Employment in the Mountain States, 1947–56: 21 pp.

Digitized by Google

**TABLE 3.—Mining employment, 1947–51 (average) and 1952–56 [1] (in thousands)**

[U. S. Department of Labor]

| Industry | 1947–51 (average) | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| Mining [2] | 12.8 | 13.4 | 13.6 | 13.0 | 14.0 | 13.4 |
| Metal | 7.5 | 8.2 | 8.2 | 8.3 | 9.4 | 10.4 |
| Bituminous coal | 4.4 | 3.8 | 4.0 | 3.2 | 3.0 | 1.1 |
| Nonmetals and other mining and quarrying | .9 | 1.4 | 1.4 | 1.5 | 1.6 | 1.9 |
| Contract construction [3] | 11.2 | 11.9 | 11.4 | 11.6 | 14.6 | 15.4 |
| Manufacturing [4] | 28.3 | 30.8 | 32.4 | 31.2 | 33.4 | 35.1 |

[1] Excludes administrative and nonworking supervisory personnel.
[2] Includes milling, quarrying, well operation, exploration and development of mineral properties, and removal of overburden.
[3] Includes some employees engaged in mining, quarrying, and removal of overburden where work was done by contractors conducting other types of construction work other than mining where separate records were not kept for work in connection with the mineral industry.
[4] Includes smelting and refining of ferrous and nonferrous metals from ore which was a part of the mineral industry.

**TABLE 4.—Hours and gross weekly earnings for mining and construction employees, 1956**

[Utah Department of Employment Security in cooperation with U. S. Department of Labor]

| Industry | Average hourly earnings | Average weekly hours | Average weekly earnings |
|---|---|---|---|
| Mining | $2.34 | 41.1 | $96.17 |
| Metal | 2.17 | 42.2 | 91.57 |
| Bituminous coal | 2.85 | 36.6 | 104.31 |
| Contract construction | 2.61 | 39.3 | 102.57 |
| Manufacturing [1] | 2.07 | 40.1 | 83.01 |

[1] Gross earnings include overtime pay, shift differential, and special special incentive pay.

**Defense Minerals Exploration Administration (DMEA).**—The Federal Government continued to participate in financing exploration projects for strategic and critical minerals in Utah in 1956 with the program administered by the DMEA. During 1956, 12 DMEA contracts—10 for uranium, 1 for manganese, and 1 for lead-zinc—were executed for a total of $827,335, compared with $1,142,211 in 1955.

Digitized by Google

TABLE 5.—DMEA contracts executed during 1956

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date 1956 | Total amount | Government participation (percent) |
| *Emery* | | | | | |
| Adams Uranium Co., Inc. | Red Buttes claims | Uranium | Aug. 7 | $16,675 | 75 |
| Pacific Uranium Mines Co. | Green River claims | do. | Mar. 9 | 73,840 | 75 |
| Twentieth Century Fuels, Inc. | Dirty Devil mine | do. | Aug. 10 | 55,080 | 75 |
| *Grand* | | | | | |
| Hamilton et al. and Simpson Mining Co.[1] | Beaver Mesa group | do. | Aug. 1 | 291,510 | 75 |
| Norbute Corp. | Sec. 36, T. 22 S., R. 21 W. | do. | Mar. 9 | 45,000 | 75 |
| *Juab* | | | | | |
| Black Jack Mining Co. | Black Jack claims | Manganese. | Mar. 12 | 24,160 | 75 |
| Privateer Mining Co. | Hornet and Downcast claims. | Lead-zinc. | Sept. 14 | 5,820 | 50 |
| *San Juan* | | | | | |
| David Borwick | Gray Horse claims | Uranium | Oct. 25 | 5,360 | 75 |
| La Sal Mining & Development Co. | La Sal project | do. | Sept. 19 | 87,132 | 75 |
| Radium King Mines, Inc. | Big Joe claim | do. | Aug. 31 | 26,280 | 75 |
| Standard-Col-U-Mex. | Ruby Bell et al. claims | do. | Oct. 29 | 38,474 | 75 |
| Westmont Explorations, Ltd. | Sun Dog et al. claims | do. | Aug. 3 | 158,004 | 75 |
| Total | | | | 827,335 | 75 |

[1] Property in Mesa County, Colo., and Grand County, Utah. Value of contract has been split 50–50.

Digitized by Google

**TABLE 6.—Major mineral industry projects started or completed in 1956 [1]**

| Company | Project | Product | Investment | Location | Date completed or anticipated |
|---|---|---|---|---|---|
| Alpha Mining & Milling Corp. | Refinery | Columbium-tantalum | Figures not released | North Salt Lake | February 1957. |
| American Gilsonite Co | 80-mile pipeline | Transporting gilsonite | $16 million (including refinery and development work). | Pipeline: Bonanza, Utah, to refinery near Grand Junction, Colo. | Spring 1957. |
| | 4-compartment shaft and preparation facilities. | Mining and preparation of gilsonite. | do | Bonanza | Spring 1956. |
| Bonneville, Ltd | Prilling plant | Prilled potash products | $250,000 | Near Wendover | Tuneup December 1956; production January 1957. |
| Calera Mining Co | Electrolytic addition to refinery. | Cobalt metal | $750,000 | Garfield | Late in 1957. |
| | Howe Sound Co. Research Center. | Metallurgical research | $200,000 | Salt Lake City | May 1956. |
| Chemical Salt Production Co. | Solar-evaporation plant | Salt for chlorine and other industries. | $370,000 | Near Grantsville | March 1956. |
| Combined Metals Reduction Co. | Refinery rebuilding and modernization. | Resin from fossil fuels | $300,000 | Bauer, Tooele County | June 1956. |
| Garfield Chemical & Manufacturing Co. | Acid-plant addition and expansion. | Sulfuric acid | $2.75 million | Garfield | December 1956. |
| General Refractories Co | New plant construction | Fire brick | Figures not released | Lehi | September 1956. |
| Interstate Brick Co | Automatic tunnel kiln | Building brick | $500,000 | Salt Lake City | May 1956. |
| Kennecott Copper Corp.: Bear Creek Mining Co. Division. | Exploration program | Lead-zinc | $8.5 million | Tintic district, Utah County. | |
| Utah Copper Division | Haulage tunnel | Copper | $12.9 million | West Mountain (Bingham) district, Salt Lake County. | October 1959. |
| | Vertical casting facilities at electrolytic refinery. | Copper cakes and billets | $2 million | Garfield | Cake facilities, June 1956; billet, November 1956. |
| Knight Ideal Coal Co | Installation of 150-ton-per-hour dense-medium coal-cleaning plant. | Coal | Figures not released | Knight mine, Carbon County. | Mid-1956. |
| Lion Coal Co | Installation Parry drier | do | do | Wattis | August 1956. |
| Northwest Pipeline Corp | Transmission line | Moving petroleum crudes | $15 million | Four Corners area to Salt Lake City. | December 1957. |
| Pacific Chemicals Co | Low-temperature carbonization pilot plant. | Coal chemicals and char | Eventually $350,000 | Wellington near Price | Rehabilitation and improvement of pilot plant continuing. |
| Pacific Northwest Pipe Line Corp. | Transmission system | Natural gas | $250 million | San Juan Basin to Canada. | Gas at Vancouver, B. C., October 1956. |
| Phillips Petroleum Co | Processing and blending facilities. | Asphalt, primarily for construction industry. | Figures not released | Woods Cross | September 1956. |
| Salt Lake Pipeline Co | Transmission-line expansion | Moving refined petroleum products. | $1 million | Salt Lake City to Spokane. | November 1956. |

Digitized by Google

| | | | | | |
|---|---|---|---|---|---|
| Salt Lake Refining Co | Platinum re-former | High-octane gasoline | Multimillion | North Salt Lake | September 1957. |
| Salt Lake Tungsten Co | Refinery addition | Ammonium paratungstate (high-purity tungsten for open market). | APT unit $40,000, other facilities $30,000. | Salt Lake City | Initial phase, May 1956; more in 1957. |
| Sure Seal Corp | Wax refinery | Wax products | $1 million programed between October 1955 and June 1957. | Woods Cross | Production now 750,000 lb. paraffins per month; anticipated at 1.5 million by June 1957. |
| Texas-Zinc Minerals Corp | Uranium mill and related facilities. | Uranium concentrate | Multimillion | Mexican Hat on Navajo Indian Reservation, San Juan County. | September 1957. |
| United States Fuel Co | Resin flotation plant | Resin concentrate | Not released | Hiawatha | November 1956. |
| | Surge-bin facility | Coal | do | do | January 1956. |
| United States Steel Corp., Columbia-Geneva Division. | Ammonia-nitrogen plant | Anhydrous ammonia, nitric acid, and ammonium nitrate. | $18 million | Columbia-Geneva works near Provo. | Tuneup operations to begin January 1957. |
| | Increase of open-hearth-furnace facilities from 260 to 300 tons daily capacity. | Steel ingots | $9 million | | Mid-1957. |
| | Addition to existing coal-chemical plant. | Improved-quality ammonium sulfate. | No cost estimate given | | Early spring, 1957. |
| Uranium Reduction Co | Uranium mill | Uranium concentrate | $8.25 million | Moab | Tuneup begun in October 1956; production in November 1956. |
| Utah Oil Refining Co | Ultraformer | High-octane gasoline | $3.5 million | Salt Lake City | August 1956. |
| | Laboratory and research building. | Analytical and research activities. | $145,000 | do | Do. |
| Vitro Uranium Co | Uranium-mill expansion and conversion to solvent extraction. | Uranium concentrate | $1.2 million | do | Latter part of 1957. |
| Western Phosphates, Inc | Expansion and improvement program. | Triple superphosphate, nitrogen phosphate, and eventually potash-containing fertilizer products. | Multimillion | Garfield | Continuous program will continue into 1958. |
| Western States Refining Co | Houdriformer | High-octane gasoline | $300,000 | North Salt Lake | December 1956. |

[1] Sources: Intermountain Industry & Mining Review, vol. 50, No. 1, January 1957, pp. 41–42. Chemical Engineering, Mid-September 1956 Inventory Issue, pp. 46–68.

Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## METALS

**Cobalt.**—In 1956 Calera Mining Co. continued to produce cobalt shot and granular cobalt material at its Garfield refinery, using an acid-leach process. Mill concentrate for the plant came from Calera's Blackbird mining and milling operation at Cobalt, Idaho. During 1956 the company—a subsidiary of Howe Sound Co.—started constructing a $750,000 electrolytic cobalt refinery at Garfield that will be capable of producing 8,000 pounds per day of high-specification

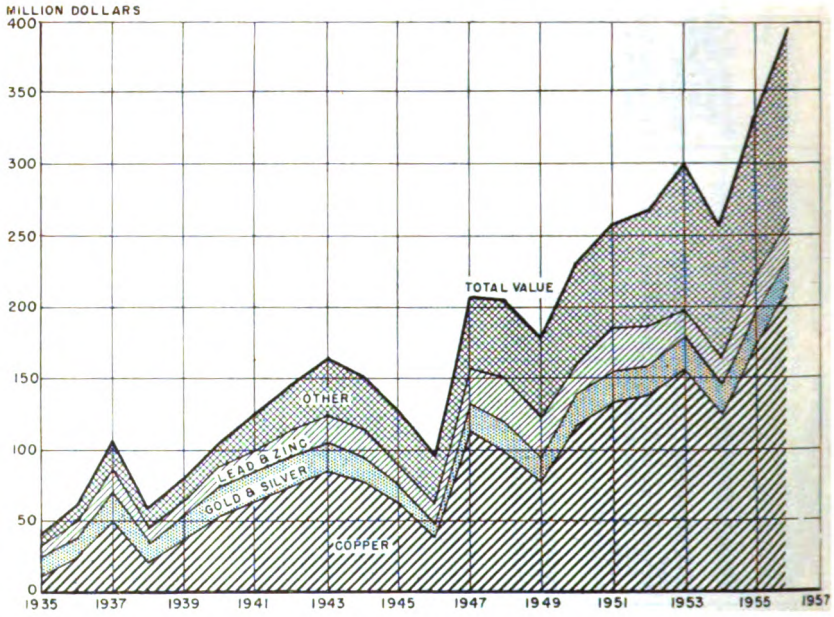



FIGURE 1.—Value of gold, silver, copper, lead, and zinc, and total value of all minerals in Utah, 1935–56.

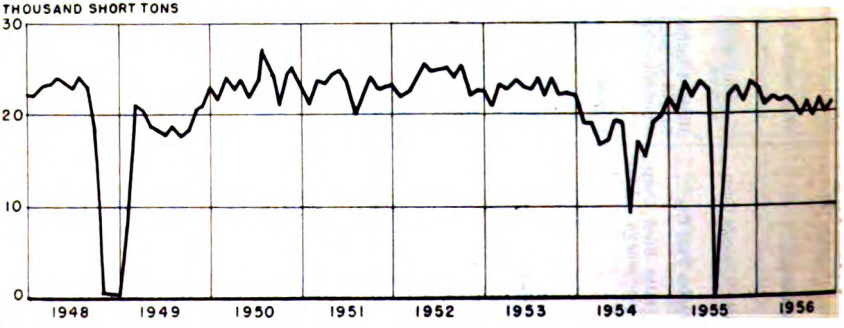



FIGURE 2.—Mine production of copper in Utah, 1948–56, by months, in terms of recoverable metals.

Digitized by Google

cobalt in the form of broken cathodes. The company expected to have the new plant in operation by late 1957.

**Copper.**—Utah copper production in 1956 increased 8 percent in quantity and 23 percent in value, compared with 1955. In copper output for 1956 Utah was exceeded only by Arizona; it was two and one-half times that of the third largest copper-producing State—Montana. The value of copper output was 54 percent ($213.0 million) of the total value of all mineral production ($397.1 million) in Utah in 1956.

**TABLE 7.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1864–1956, in terms of recoverable metals [1]**

| Year | Mines producing | | Material sold or treated [2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947-51 (average) | 99 | 2 | 28,266,186 | 396,782 | $13,957,363 | 7,388,943 | $6,687,288 |
| 1952 | 63 | ------ | 32,875,034 | 435,507 | 15,242,745 | 7,194,109 | 6,511,032 |
| 1953 | 55 | 1 | 30,682,662 | 483,430 | 16,920,050 | 6,725,807 | 6,087,195 |
| 1954 | 54 | ------ | 24,846,805 | 403,401 | 14,119,035 | 6,179,243 | 5,592,527 |
| 1955 | 63 | ------ | 28,598,662 | 441,206 | 15,442,210 | 6,250,565 | 5,657,077 |
| 1956 | 91 | ------ | 33,232,267 | 416,031 | 14,561,085 | 6,572,041 | 5,948,029 |
| 1864-1956 | ------ | ------ | [3] 861,169,048 | 14,816,462 | 418,801,210 | 789,038,998 | 587,318,061 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947-51 (average) | 248,100 | $107,059,026 | 80,785 | $16,130,646 | 38,366 | $10,635,861 | $154,470,184 |
| 1952 | 282,894 | 136,920,696 | 50,210 | 16,167,620 | 32,947 | 10,938,404 | 185,780,497 |
| 1953 | 269,496 | 154,690,704 | 41,522 | 10,878,764 | 29,184 | 6,712,320 | 195,289,033 |
| 1954 | 211,835 | 124,982,650 | 44,972 | 12,322,328 | 34,031 | 7,350,696 | 164,367,236 |
| 1955 | 232,949 | 173,779,954 | 50,452 | 15,034,696 | 43,556 | 10,714,776 | 220,628,713 |
| 1956 | 250,604 | 213,013,400 | 49,555 | 15,560,270 | 42,374 | 11,610,476 | 260,693,260 |
| 1864-1956 | 7,388,720 | 2,711,073,025 | 4,909,675 | 639,874,484 | 1,356,931 | 238,477,919 | 4,595,544,699 |

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailing or slime re-treated; and ore, old tailing, or copper precipitate shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed or tonnage of precipitate shipped.
[3] Figures estimated for certain years before 1901.

**TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 38,607 | 536,857 | 22,379 | 3,589 | 3,079 |
| February | 35,800 | 518,113 | 20,628 | 4,110 | 3,311 |
| March | 36,007 | 545,045 | 21,583 | 3,869 | 3,388 |
| April | 36,547 | 514,220 | 21,175 | 3,533 | 3,239 |
| May | 37,184 | 584,592 | 21,494 | 4,337 | 3,668 |
| June | 33,677 | 608,767 | 21,002 | 4,630 | 3,718 |
| July | 28,582 | 505,754 | 19,455 | 4,353 | 3,473 |
| August | 30,346 | 560,854 | 20,979 | 3,391 | 2,942 |
| September | 34,722 | 562,627 | 19,650 | 4,234 | 3,754 |
| October | 34,665 | 559,240 | 21,438 | 4,373 | 3,943 |
| November | 33,978 | 537,727 | 19,917 | 4,485 | 3,886 |
| December | 35,916 | 538,245 | 20,904 | 4,651 | 3,973 |
| Total | 416,031 | 6,572,041 | 250,604 | 49,555 | 42,374 |



Digitized by Google

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals**

| County and district | Mines producing [1] (lode) | Lode material sold or treated [2] (short tons) | Gold | | Silver | | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Fine ounces | Value | Fine ounces | Value | Pounds | Value | Pounds | Value | Pounds | Value | |
| Beaver County: | | | | | | | | | | | | | |
| Beaver Lake | 3 | 1,075 | 4 | $140 | 261 | $236 | 42,200 | $17,935 | | | | | $18,311 |
| Lincoln | 2 | 72 | 8 | 280 | 235 | 213 | 6,500 | 2,762 | | | | | 3,255 |
| Rocky | 1 | 23 | | | 19 | 17 | 600 | 255 | | | | | 272 |
| San Francisco | 2 | 3,559 | 12 | 420 | 986 | 892 | 152,000 | 64,600 | 700 | $110 | 400 | $55 | 66,077 |
| Star and North Star | 2 | 46 | 2 | 70 | 289 | 262 | 1,300 | 553 | 8,000 | 1,256 | | | 2,141 |
| Total | 10 | 4,775 | 26 | 910 | 1,790 | 1,620 | 202,600 | 86,105 | 8,700 | 1,366 | 400 | 55 | 90,056 |
| Box Elder County: | | | | | | | | | | | | | |
| Lucin | 1 | 12 | | | 70 | 63 | 100 | 43 | 200 | 31 | | | 137 |
| Promontory | 1 | 4 | | | 2 | 2 | | | 400 | 63 | 500 | 68 | 133 |
| Total | 2 | 16 | | | 72 | 65 | 100 | 43 | 600 | 94 | 500 | 68 | 270 |
| Davis County | 1 | 13 | | | 2 | 2 | 1,100 | 467 | | | | | 469 |
| Grand County: Salt Valley | 3 | 124 | | | 121 | 110 | 4,100 | 1,743 | 100 | 16 | | | 1,869 |
| Juab County: | | | | | | | | | | | | | |
| Detroit (Drum Mountain) | 2 | 173 | 15 | 525 | 441 | 399 | 8,200 | 3,485 | | | | | 4,409 |
| Fish Springs | 1 | 7 | | | 111 | 100 | | | 1,400 | 220 | 100 | 14 | 334 |
| Mount Nebo (Mona) | 2 | 2,741 | 1 | 35 | 1,330 | 1,204 | | | 179,600 | 28,197 | 11,400 | 1,562 | 30,998 |
| Tintic [3] | 12 | 77,588 | 2,414 | 84,490 | 369,060 | 334,018 | 164,800 | 70,040 | 6,121,800 | 961,122 | 2,237,000 | 306,469 | 1,756,139 |
| West Tintic | 1 | 4 | | | 2 | 2 | 300 | 128 | | | | | 130 |
| Total | 18 | 80,513 | 2,430 | 85,050 | 370,944 | 335,723 | 173,300 | 73,653 | 6,302,800 | 989,539 | 2,248,500 | 308,045 | 1,792,010 |
| Piute County: | | | | | | | | | | | | | |
| Mount Baldy | 1 | 44 | 13 | 455 | 1,166 | 1,055 | 200 | 85 | 400 | 63 | 600 | 82 | 1,740 |
| Ohio | 1 | 130 | 12 | 420 | 1,051 | 951 | 2,200 | 935 | 1,600 | 251 | | | 2,557 |
| Total | 2 | 174 | 25 | 875 | 2,217 | 2,006 | 2,400 | 1,020 | 2,000 | 314 | 600 | 82 | 4,297 |
| Salt Lake County: | | | | | | | | | | | | | |
| Big Cottonwood, Little Cottonwood, and Smelter [4] | 4 | 48,541 | 9 | 315 | 6,879 | 6,226 | 23,900 | 10,158 | 940,100 | 147,595 | 7,147,200 | 979,166 | 1,143,460 |
| West Mountain (Bingham) | 5 | 32,689,659 | 393,227 | 13,762,945 | 4,540,530 | 4,109,409 | 498,834,900 | 212,004,832 | 65,781,400 | 10,327,680 | 48,620,800 | 6,661,050 | 246,865,916 |
| Total | 9 | 32,738,200 | 393,236 | 13,763,260 | 4,547,409 | 4,115,635 | 498,858,800 | 212,014,990 | 66,721,500 | 10,475,275 | 55,768,000 | 7,640,216 | 248,009,376 |
| San Juan County: White Canyon | 1 | 360 | | | 456 | 413 | 66,500 | 28,262 | | | | | 28,675 |

Digitized by Google

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sevier County: | | | | | | | | | | | | | |
| Henry | 2 | 12 | 10 | 350 | 600 | 543 | | | | | | | 893 |
| Redmond | 1 | 4 | | | 7 | 6 | | | 100 | 16 | 2,700 | 370 | 392 |
| Total | 3 | 16 | 10 | 350 | 607 | 549 | | | 100 | 16 | 2,700 | 370 | 1,285 |
| Summit County: Uintah | 6 | 241,013 | 3,945 | 138,075 | 945,319 | 855,561 | 444,200 | 188,785 | 12,427,400 | 1,951,102 | 15,050,800 | 2,063,151 | 5,196,674 |
| Tooele County: | | | | | | | | | | | | | |
| Blue Bell | 2 | 60 | 1 | 35 | 669 | 605 | | | 25,300 | 3,972 | | | 4,612 |
| Clifton | 8 | 101 | 6 | 210 | 1,036 | 938 | 4,500 | 1,913 | 16,800 | 2,638 | 200 | 27 | 5,726 |
| Columbia | 1 | 9 | | | 12 | 11 | | | 2,200 | 345 | 400 | 55 | 411 |
| Dugway | 1 | 35 | 1 | 35 | 139 | 126 | 100 | 42 | 14,600 | 2,292 | 8,600 | 1,178 | 3,673 |
| Erickson | 1 | 188 | 1 | 35 | 122 | 110 | 100 | 42 | 9,700 | 1,523 | 15,400 | 2,110 | 3,820 |
| Lakeside | 1 | 1 | | | 3 | 3 | | | 700 | 110 | | | 113 |
| Ophir | 4 | 15,421 | 120 | 4,200 | 109,281 | 98,905 | 212,900 | 90,483 | 1,924,300 | 302,115 | 1,341,800 | 183,827 | 679,530 |
| Rush Valley | 3 | 60,009 | 2,035 | 71,225 | 198,069 | 179,262 | 83,100 | 35,318 | 5,058,400 | 794,169 | 3,070,100 | 420,604 | 1,500,578 |
| Smelter | | 1,787 | 5 | 175 | 840 | 760 | 8,000 | 3,400 | 39,400 | 6,186 | 174,300 | 23,879 | 34,400 |
| Total | 21 | 77,620 | 2,169 | 75,915 | 310,171 | 280,720 | 308,700 | 131,198 | 7,091,400 | 1,113,350 | 4,610,800 | 631,680 | 2,232,863 |
| Utah County: | | | | | | | | | | | | | |
| American Fork | 1 | 12 | | | 78 | 71 | | | 3,300 | 518 | | | 589 |
| Tintic [3] | 8 | 11,480 | 477 | 16,695 | 128,140 | 115,973 | 47,300 | 20,102 | 678,400 | 106,509 | 150,200 | 20,577 | 279,856 |
| Total | 9 | 11,492 | 477 | 16,695 | 128,218 | 116,044 | 47,300 | 20,102 | 681,700 | 107,027 | 150,200 | 20,577 | 280,445 |
| Wasatch County: Blue Ledge | 2 | 75,712 | 13,702 | 479,570 | 252,971 | 228,952 | 877,300 | 372,852 | 5,866,700 | 921,072 | 6,906,800 | 946,232 | 2,945,678 |
| Washington County: | | | | | | | | | | | | | |
| Harrisburg (Leeds) | 1 | 706 | 4 | 140 | 11,257 | 10,188 | 3,600 | 1,530 | | | | | 11,868 |
| Tutsagubet | 3 | 1,533 | 7 | 245 | 487 | 441 | 218,000 | 92,650 | 7,000 | 1,099 | | | 94,435 |
| Total | 4 | 2,239 | 11 | 385 | 11,744 | 10,629 | 221,600 | 94,180 | 7,000 | 1,099 | | | 106,293 |
| Total: 1956 | 91 | 33,232,267 | 416,031 | 14,561,085 | 6,572,041 | 5,948,029 | 501,208,000 | 213,013,400 | 99,110,000 | 15,560,270 | 84,748,000 | 11,610,476 | 260,693,260 |
| 1955 | 63 | 28,598,662 | 441,206 | 15,442,210 | 6,250,565 | 5,657,077 | 465,898,000 | 173,779,954 | 100,904,000 | 15,034,696 | 87,112,000 | 10,714,776 | 220,628,713 |

[1] Operation at slag dumps and old mill or miscellaneous cleanups not counted as a producing mine.
[2] Does not include tonnage of precipitate shipped.
[3] Tintic district lies in both Juab and Utah Counties.
[4] Figures combined to avoid disclosing individual company confidential data.

Digitized by Google

**TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals**

| Source | Number of mines [1] | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Lode ore: | | | | | | | |
| Dry gold | 1 | 8 | 3 | 5 | | | |
| Dry gold-silver | 22 | 113,350 | 2,920 | 392,284 | 393,900 | 1,271,900 | 600 |
| Dry silver | 23 | 31,646 | 824 | 235,343 | 127,000 | 1,345,100 | 1,100 |
| Total | 49 | 145,004 | 3,747 | 627,632 | 520,900 | 2,617,000 | 1,700 |
| Copper | 15 | 32,322,279 | 379,022 | 2,925,627 | 486,548,600 | | |
| Copper-lead | 1 | 20 | | 224 | 1,600 | 2,000 | |
| Copper-lead-zinc | 1 | 50 | | 27 | 200 | 700 | 400 |
| Lead | 25 | 21,928 | 839 | 183,487 | 105,300 | 3,448,200 | 344,700 |
| Lead-zinc | 18 | 574,871 | 29,857 | 2,561,327 | 3,661,800 | 89,230,000 | 74,897,800 |
| Zinc | 2 | 11 | | 26 | | 500 | 6,900 |
| Total | 55 | 32,919,159 | 409,718 | 5,670,718 | 490,317,500 | 92,681,400 | 75,249,700 |
| Other "lode" material: | | | | | | | |
| Old tailings [2] | 6 | 117,190 | 2,551 | 268,004 | 224,000 | 2,967,400 | 2,222,300 |
| Copper precipitates | 2 | 6,505 | | | 10,049,400 | | |
| Old slag [3] | 4 | 50,914 | 15 | 5,687 | 96,200 | 854,200 | 7,274,300 |
| Total | 12 | 174,609 | 2,566 | 273,691 | 10,369,600 | 3,811,600 | 9,496,600 |
| Total "lode" material | 91 | 33,238,772 | 416,031 | 6,572,041 | 501,208,000 | 99,110,000 | 84,748,000 |

[1] Details will not necessarily add to totals, because some mines produce more than 1 class of material.
[2] Silver, 79,688 tons; lead-zinc, 37,502 tons.
[3] Copper, 1,068 tons; lead, 1,042 tons; zinc, 48,804 tons.

**TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals**

| Type of material processed and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Concentration, and smelting of concentrates: | | | | | |
| Ore | 408,843 | 5,487,017 | 489,966,400 | 89,260,900 | 74,780,900 |
| Old tailings | 1,153 | 62,105 | 45,000 | 1,749,800 | 2,202,700 |
| Total | 409,996 | 5,549,122 | 490,011,400 | 91,010,700 | 76,983,600 |
| Direct-smelting: | | | | | |
| Ore | 4,622 | 811,333 | 872,000 | 6,037,500 | 470,500 |
| Copper precipitates | | | 10,049,400 | | |
| Old tailings | 1,398 | 205,899 | 179,000 | 1,207,600 | 19,600 |
| Old slag | 15 | 5,687 | 96,200 | 854,200 | 7,274,300 |
| Total | 6,035 | 1,022,919 | 11,196,600 | 8,099,300 | 7,764,400 |
| Grand total | 416,031 | 6,572,041 | 501,208,000 | 99,110,000 | 84,748,000 |

Digitized by Google

**TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and classes of material processed, in terms of recoverable metals**

*A. For material treated at mills*

| | Material treated (short tons) | Concentrate shipped to smelters and recoverable metals | | | | | |
|---|---|---|---|---|---|---|---|
| | | Concentrate (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| | BY COUNTIES | | | | | | |
| Beaver | 50 | 5 | | 27 | 200 | 700 | 400 |
| Juab | 20,093 | 5,943 | 396 | 81,666 | 21,800 | 2,488,800 | 2,046,100 |
| Salt Lake | 32,681,185 | 989,986 | 392,669 | 4,450,285 | 488,679,600 | 64,638,400 | 48,575,300 |
| Summit | 83,427 | 20,369 | 1,087 | 459,389 | 143,400 | 11,088,300 | 15,039,600 |
| Tooele | 75,195 | 13,204 | 2,144 | 303,341 | 288,600 | 6,927,800 | 4,415,400 |
| Wasatch | 75,578 | 17,461 | 13,700 | 252,642 | 877,100 | 5,866,700 | 6,906,800 |
| Washington | 252 | 10 | | 1,772 | 700 | | |
| Total: 1956 | 32,935,780 | 1,046,978 | 409,996 | 5,549,122 | 490,011,400 | 91,010,700 | 76,983,600 |
| 1955 | 28,346,943 | 927,349 | 436,000 | 5,488,251 | 451,988,400 | 93,906,150 | 78,686,500 |
| | BY CLASSES OF MATERIAL TREATED | | | | | | |
| Dry silver: Crude ore | 252 | 10 | | 1,772 | 700 | | |
| Copper: Crude ore | 32,321,100 | 843,399 | 379,005 | 2,924,494 | 486,304,400 | | |
| Copper-lead-zinc: Crude ore | 50 | 5 | | 27 | 200 | 700 | 400 |
| Lead: Crude ore | 2,700 | 171 | 1 | 1,177 | | 175,300 | |
| Lead-zinc: Crude ore | 574,176 | 199,269 | 29,837 | 2,559,547 | 3,661,100 | 89,084,900 | 74,780,500 |
| Old tailings | 37,502 | 4,124 | 1,153 | 62,105 | 45,000 | 1,749,800 | 2,202,700 |
| Total 1956 | 32,935,780 | 1,046,978 | 409,996 | 5,549,122 | 490,011,400 | 91,010,700 | 76,983,600 |
| BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS | | | | | | | |
| Copper | | 844,405 | 379,128 | 2,942,473 | 486,767,800 | 48,400 | |
| Copper-lead | | 7,242 | 9,474 | 284,858 | 560,800 | 7,155,100 | 115,200 |
| Copper-lead-zinc | | 1 | 6 | 246 | 100 | 1,500 | 300 |
| Iron [1] | | 49,757 | 5,476 | 150,336 | 287,800 | 1,203,900 | 42,900 |
| Lead | | 73,839 | 10,428 | 1,819,810 | 1,311,600 | 75,626,200 | 1,451,200 |
| Lead-zinc | | 1,640 | 976 | 56,448 | 32,400 | 1,688,400 | 214,200 |
| Zinc | | 70,094 | 4,508 | 294,951 | 1,050,900 | 5,287,200 | 75,159,800 |
| Total 1956 | | 1,046,978 | 409,996 | 5,549,122 | 490,011,400 | 91,010,700 | 76,983,600 |

**See footnotes at end of table.**

Digitized by Google

**TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and classes of material processed, in terms of recoverable metals—Continued**

*B. For material shipped directly to smelters*

| | Material shipped (short tons) | Recoverable metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **BY COUNTIES** | | | | | | |
| Beaver | 4,725 | 26 | 1,763 | 202,400 | 8,000 | |
| Box Elder | 16 | | 72 | 100 | 600 | 600 |
| Davis | 13 | | 2 | 1,100 | | |
| Grand | 124 | | 121 | 4,100 | 100 | |
| Juab | 60,420 | 2,034 | 289,278 | 151,500 | 3,814,000 | 202,400 |
| Piute | 174 | 25 | 2,217 | 2,400 | 2,000 | 600 |
| Salt Lake | 63,520 | 567 | 97,124 | 10,179,200 | 2,083,100 | 7,192,700 |
| San Juan | 360 | | 456 | 66,500 | | |
| Sevier | 16 | 10 | 607 | | 100 | 2,700 |
| Summit | 157,586 | 2,858 | 485,930 | 300,800 | 1,339,100 | 19,900 |
| Tooele | 2,425 | 25 | 6,830 | 20,100 | 163,600 | 195,400 |
| Utah | 11,492 | 477 | 128,218 | 47,300 | 681,700 | 150,200 |
| Wasatch | 134 | 2 | 329 | 200 | | |
| Washington | 1,987 | 11 | 9,972 | 220,900 | 7,000 | |
| Total: 1956 | 302,992 | 6,035 | 1,022,919 | 11,196,600 | 8,099,300 | 7,764,400 |
| 1955 | 260,049 | 5,206 | 762,314 | 13,909,600 | 6,997,850 | 8,425,600 |
| **BY CLASSES OF MATERIAL** | | | | | | |
| Dry gold: Crude ore | 8 | 3 | 5 | | | |
| Dry gold-silver: Crude ore | 113,350 | 2,920 | 392,284 | 393,900 | 1,271,900 | 600 |
| Dry silver: | | | | | | |
| Crude ore | 31,394 | 824 | 233,571 | 126,300 | 1,345,100 | 1,100 |
| Old tailings | 79,688 | 1,398 | 205,899 | 179,000 | 1,207,600 | 19,600 |
| Copper: | | | | | | |
| Crude ore | 1,179 | 17 | 1,133 | 244,200 | | |
| Precipitates | 6,505 | | | 10,049,400 | | |
| Old slag | 1,068 | 5 | 377 | 65,600 | 7,000 | |
| Copper-lead: Crude ore | 20 | | 224 | 1,600 | 2,000 | |
| Lead: | | | | | | |
| Crude ore | 19,228 | 838 | 182,310 | 105,300 | 3,272,900 | 344,700 |
| Old slag | 1,042 | 5 | 840 | 3,900 | 33,100 | |
| Lead-zinc: Crude ore | 695 | 20 | 1,780 | 700 | 145,100 | 117,300 |
| Zinc: | | | | | | |
| Crude ore | 11 | | 26 | | 500 | 6,800 |
| Old slag | 48,804 | 5 | 4,470 | 26,700 | 814,100 | 7,274,300 |
| Total: 1956 | 302,992 | 6,035 | 1,022,919 | 11,196,600 | 8,099,300 | 7,764,400 |

[1] From lead-zinc ore and lead-zinc tailing.

Utah Copper Division of Kennecott Copper Corp., the Nation's leading copper producer, furnished one-quarter of the entire domestic copper output and 99 percent of the State output in 1956. A record production from this operation was reported in 1956; copper output increased 8 percent, and ore mined and milled increased 17 percent, compared with 1955. Most of the advance in copper output in the State resulted from this gain. The U. S. and Lark mine of the United States Smelting Refining and Mining Co. was the second-ranking copper producer in Utah. Copper was recovered from copper, lead, zinc, and iron (pyrite) concentrates produced from the ore (classed as lead-zinc ore) mined and milled. Copper also was recovered from ore (classed as silver and lead ores) and copper precipitate shipped directly to the smelter from the mine. The next-

Digitized by Google

**TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and classes of material processed, in terms of gross metal content**

| Class of material | Material shipped or treated (short tons) | Gross metal content | | | | |
|---|---|---|---|---|---|---|
| | | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
| **CONCENTRATE SHIPPED TO SMELTERS** | | | | | | |
| Copper | 844,405 | 379,128 | 2,942,473 | 491,901,357 | 80,731 | 78,964 |
| Copper-lead | 7,242 | 9,474 | 284,858 | 728,386 | 7,414,236 | 1,291,494 |
| Copper-lead-zinc | 1 | 6 | 246 | 116 | 1,554 | 353 |
| Iron [1] | 49,757 | 5,476 | 150,336 | 384,038 | 1,254,619 | 1,253,287 |
| Lead | 73,839 | 10,428 | 1,819,810 | 1,708,582 | 78,260,415 | 8,976,957 |
| Lead-zinc | 1,640 | 976 | 56,448 | 38,090 | 1,717,587 | 271,098 |
| Zinc | 70,094 | 4,508 | 294,951 | 1,236,452 | 5,566,691 | 76,929,304 |
| Total: 1956 | 1,046,978 | 409,996 | 5,549,122 | 495,997,021 | 94,295,833 | 88,801,457 |
| 1955 | 927,349 | 436,000 | 5,488,251 | 457,045,016 | 97,344,446 | 89,312,115 |
| **ORE, ETC., SHIPPED DIRECTLY TO SMELTERS** | | | | | | |
| Dry gold: Crude ore | 8 | 3 | 5 | 16 | | |
| Dry gold-silver: Crude ore | 113,350 | 2,920 | 392,284 | 402,463 | 2,076,402 | 797 |
| Dry silver: | | | | | | |
| Crude ore | 31,394 | 824 | 233,571 | 130,522 | 2,218,595 | 39,178 |
| Old tailings | 79,688 | 1,398 | 205,899 | 182,879 | 2,003,720 | 24,797 |
| Copper: | | | | | | |
| Crude ore | 1,179 | 17 | 1,138 | 249,629 | | |
| Precipitates | 6,505 | | | 10,202,629 | | |
| Old slag | 1,068 | 5 | 377 | 66,987 | 11,648 | |
| Copper-lead: Crude ore | 20 | | 224 | 1,699 | 3,325 | |
| Lead: | | | | | | |
| Crude ore | 19,228 | 838 | 182,310 | 135,788 | 3,374,632 | 436,317 |
| Old slag | 1,042 | 5 | 840 | 5,242 | 34,512 | |
| Lead-zinc: Crude ore | 695 | 20 | 1,781 | 1,397 | 148,171 | 148,075 |
| Zinc: | | | | | | |
| Crude ore | 11 | | 35 | 37 | 599 | 7,946 |
| Old slag | 48,804 | 5 | 5,758 | 224,888 | 865,540 | 8,601,229 |
| Total: 1956 | 302,992 | 6,035 | 1,024,222 | 11,604,176 | 10,737,144 | 9,258,339 |
| 1955 | 260,049 | 5,260 | 766,167 | 14,371,362 | 8,870,711 | 10,637,186 |

[1] From lead-zinc ore and lead-zinc tailing.

ranking copper producer in the State was the Mayflower-Park Galena operation of New Park Mining Co., where copper was recovered as a byproduct of lead-zinc ore mined and milled.

**Gold.**—Gold output in Utah declined 6 percent in 1956 compared with 1955, but the State continued to rank second only to South Dakota in terms of quantity of gold produced. This drop in output primarily was the result of decreased production from 2 (Utah Copper and Mayflower-Park Galena) of the 3 leading gold producers. The leading 3 (including U. S. and Lark) supplied 98 percent of the total gold output in Utah in 1956. Most of the gold (98 percent) was recovered from ores of copper, lead, and lead-zinc, but 1 percent came from ores of gold and silver and 1 percent from old tailing and old slag. The decreased production of gold in 1956 can be attributed directly to a drop in the gold content of the copper and lead-zinc ores mined at the major Utah producers.

**Iron Ore.**—As the result of increased demand for pig iron and steel, shipments of iron ore from deposits in Utah in 1956 advanced 4 percent above 1955. Shipments by the major iron-ore producer (Colum-

Digitized by Google

bia Iron Mining Co., subsidiary of United States Steel Corp.) was limited to 11 months in 1956 because of a labor strike during July at the Geneva and Ironton works of the corporation Columbia-Geneva Division. Iron ore was mined by 4 companies in 1956 from 10 open-pit operations in Iron County and shipped directly to markets without concentration. The ore averaged 52.4 percent iron and was used for making pig iron and steel, except for a small quantity for paint pigment.

**TABLE 14.—Shipments of usable iron ore, 1947–51 (average), 1952–56, and total 1906–56**

| Year | Long tons | Value | Year | Long tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 3,300,291 | $5,415,805 | 1955 | 3,847,402 | $24,687,485 |
| 1952 | 3,990,505 | 15,025,899 | 1956 | 4,001,739 | 27,508,089 |
| 1953 | 4,617,288 | 26,496,956 | | | |
| 1954 | 3,040,646 | 19,277,434 | 1906–56 | 46,652,517 | 157,349,058 |

Columbia Iron Mining Co. ore shipments (hematite mixed with a small quantity of magnetite) from the Desert Mound and Iron Mountain mines went to the company blast and open-hearth furnaces at Geneva and Ironton, Utah. The second-ranking iron-ore producer in Utah—Colorado Fuel & Iron Corp.—shipped magnetite ore from the Blowout, Comstock, and Duncan mines to its plant at Pueblo, Colo., for use in making pig iron and steel. The Utah Construction Co. shipped hematite ore from the Excelsior mine to domestic consumers and to Japan. Helene E. Beatty mined magnetite ore from the Blue Jay, Juniper, Splinter, and Great Western Placer claims for shipment to domestic markets.

The Columbia Iron Mining Co. purchased 18 iron-ore claims, which are a part of the Rex ore body in the Iron Mountain area west of Cedar City, Utah, for a reported $1 million in 1956. An expansion program to increase production capacity of its 10 open-hearth furnaces from 1.9 million to 2.2 million ingot tons per year was continued at the Columbia-Geneva Division works. Consolidated Western Steel Pipe Co., another United States Steel Corp. subsidiary, reported installation of facilities at its plant near Geneva for manufacturing small-diameter, resistant-welded line and water pipe in sizes from 4 to 12¾ inches.

**Lead.**—In 1956 the quantity of lead produced in Utah decreased 2 percent, but the value of the lead output increased 3 percent because of the higher price throughout the year for lead compared with 1955. The higher price virtually stabilized lead output but apparently was not enough to encourage Utah miners to expand operations, reopen closed mines, or intensify exploration and development.

The U. S. and Lark mine at Bingham, operated by United States Smelting Refining and Mining Co., remained the leading lead producer in Utah by far. It was followed in order of output by four mines operated by United Park City Mines Co., New Park Mining Co., Eagle & Blue Bell Mining Co., and Combined Metals Reduction Co., respectively. The total lead output from these 5 mines was 91 percent of the Utah lead production in 1956.

Digitized by Google

New Park Mining Co. activity at the Mayflower-Park Galena mine was suspended on August 30 and resumed September 17 on a curtailed basis. Early in March the company, which had been shipping its ore to Combined Metals Reduction Co. Bauer mill, signed a milling agreement with the United States Smelting Refining and Milling Co. to treat the New Park ore at its Midvale concentrator and smelter. As a result of this, operations at the Bauer mill of Combined Metals were materially reduced.

It was reported that United Park City Mines Co. made several encouraging discoveries of ore in its mine during 1956 and that the company spent approximately $1 million on exploration and development and increased monthly ore production from 6,500 to more than 7,000 tons.

Bear Creek Mining Co.—a Kennecott Copper Corp. exploration subsidiary—completed agreements with several firms having properties in the Tintic district, Utah County, for an extensive exploration program involving 10,000 acres of claims and a possible expenditure of $8.5 million. The company already had done considerable drilling on the properties. It contracted with Centennial Development Co. for sinking a 1,020-foot-deep, 2½-compartment shaft on ground held by the Apex Standard Mining Co., an affiliate of Chief Consolidated Mining Co.

In 1956 a DMEA contract for a total amount of $5,820 was written between the United States Government and the Privateer Mining Co. on the basis of equal shares financial participation for lead-zinc exploration on the Hornet & Downcast claims.

**Manganese and Manganiferous Ore and Concentrate.**—A total of 3,019 long dry tons of ore (or concentrate) averaging 26.5 percent manganese valued at $106,346 and 117 tons of ore (or concentrate) with an average manganese content of 35.5 percent and valued at $7,394 was shipped from Utah mines in 1956 to the Government (GSA) Butte (Mont.) Purchasing Depot. This material was marketed under the low-grade, manganese-ore-purchasing program and will be credited as production in the year a useful product is shipped from the depot. The ore came from 4 mines—2 in Juab County and 1 each in Millard and Weber Counties. In 1956, as in 1955, the Black Boy and Staats Manganese mines in Juab County, operated by L. J. Price and Fred Staats, respectively, were the major manganese-ore producers in Utah. A DMEA contract was executed during the year for manganese exploration on the Black Jack claims by Black Jack Mining Co.; Government participation was 75 percent of the total cost ($24,160).

**Molybdenum.**—As in past years, the Utah Copper mine—a Utah Copper Division-Kennecott Copper Corp. operation—was the only producer of molybdenum in Utah in 1956. Molybdenum concentrate was recovered as a flotation byproduct of the treatment of copper ore from this mine at the company Arthur and Magna concentration mills. Output in 1956 was virtually the same as 1955, but the value was higher because of the increased price for molybdenum in 1956.

**Silver.**—In terms of silver output, Utah ranked third in the United States in 1956, with Idaho first and Montana second. Production was 5 percent above 1955. Eighty-six percent of the silver output was recovered as a byproduct of ores of copper, lead, and zinc; 10

Digitized by Google

percent came from ores of gold and silver; and the remaining 4 percent was derived from old tailing and slag. In 1956 silver output from the two leading producers was increased. The top five (listed in order of silver output) were Utah Copper, U. S. and Lark, United Park City Mines, Mayflower-Park Galena, and Ontario dump. These mines accounted for 84 percent of the total Utah silver production.

**Tungsten.**—In 1956 tungsten output from Utah mines was one-sixth of that reported in 1955. Part of this drop was attributable to the uncertainty of the Government domestic tungsten purchase program. The purchase quota of the program was filled in May, and the new law extending the program was enacted in July. Under the new program the price was $55 per short-ton unit of $WO_3$, compared with the previous price of $63. The funds for the new program were exhausted early in December.

Production in 1956 came from 10 mines in 5 counties. Millard County furnished 67 percent of the value of the tungsten production in Utah. Mid-States Development, Inc.—1 of the 3 tungsten-mining operations in Millard County—was the largest tungsten producer in the county and the State in 1956. The Treasure Mountain Mining Co. operation, also in Millard County, was the second largest tungsten producer in the State.

In 1956 an agreement was executed between Rigby Bros. and three operating companies (Sun Uranium Co., Lucky Star Uranium Co., and Baggs Uranium Co.) for mining and milling tungsten ores from claims in the Desert Peak area of the Newfoundland Range near Groome, 80 miles west of Ogden. To treat the ore the Sun Star Milling Co.—an affiliate of the three companies—purchased the H. M. & S. tungsten mill in Salt Lake City.

In addition to treating custom ores from Utah, the Salt Lake Tungsten Co. synthetic scheelite plant in Salt Lake City processed concentrate from the Mineral Engineering Co. property at Glen, Mont. The Salt Lake Tungsten Co. continued to operate its ammonia paratungstate unit of the plant, which bypasses several "end-refining" operations required in processing of artificial scheelite. Part of this product was used for electric light filaments.

**Uranium.**—Utah mine production of uranium ore for the period July 1955 to June 1956 totaled 772,000 tons, averaging 0.31 percent contained $U_3O_8$. Production information is based on data supplied to the Federal Bureau of Mines by the AEC. The State tonnage represented 35 percent of domestic total for the period. Major producing counties in Utah were San Juan, Emery, Piute, and Grand.

The State ore reserve, as of November 1, totaled 7.5 million tons at 0.34 percent contained $U_3O_8$ and formed 12.5 percent of national total.[4] The reserves given included measured, indicated, and inferred ores. One-quarter of the State reserve was of the last class. Approximately 85 percent of the reserve was in San Juan County.

Capacities of operating uranium mills were as follows (tons of ore per day): Monticello, 600; Moab, 1,500; and Salt Lake City, 550.[5] The mill at Moab was placed in operation in November. Ore processed at Moab originated, for the most part, from mines of the Big

[4] Grand Junction (Colo.) Office, AEC, Statistics on Domestic Uranium Production and Ore Reserves: Press Release 178, Dec. 13, 1956, p. 3.
[5] Work cited in footnote 4, p 2.

Digitized by Google

Indian district. At Mexican Hat construction was begun on a 775-ton-per-day mill to process ores from the Happy Jack mine and other mines in the White Canyon and Monument Valley areas.

**TABLE 15.—Mine production of uranium ore in Utah, July 1955–June 1956[1]**

| County | July–December 1955 | | | January–June 1956 | | |
|---|---|---|---|---|---|---|
| | Number of properties | Ore (short tons) | $U_3O_8$ contained (pounds) | Number of properties | Ore (short tons) | $U_3O_8$ contained (pounds) |
| Beaver | 2 | (2) | (2) | 1 | (2) | (2) |
| Box Elder | 1 | (2) | (2) | | | |
| Davis | 1 | (2) | (2) | | | |
| Emery | 51 | 62, 338 | 322, 193 | 58 | 65, 417 | 360, 066 |
| Garfield | 54 | 3, 194 | 20, 833 | 45 | 3, 232 | 22, 511 |
| Grand | 52 | 13, 297 | 82, 666 | 68 | 12, 473 | 65, 616 |
| Kane | 1 | (2) | (2) | 2 | (2) | (2) |
| Piute | 4 | (2) | (2) | 5 | (2) | (2) |
| San Juan | 153 | 256, 887 | 1, 714, 331 | 164 | 315, 639 | 2, 031, 109 |
| Sevier | | | | 1 | (2) | (2) |
| Uintah | | | | 1 | (2) | (2) |
| Washington | | | | 1 | (2) | (2) |
| Wayne | 11 | 455 | 2, 384 | 17 | 887 | 4, 331 |
| Undistributed | | 16, 995 | 76, 467 | | 21, 559 | 105, 903 |
| Total | 330 | 353, 166 | 2, 218, 874 | 363 | 419, 207 | 2, 589, 536 |

[1] Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

**Vanadium.**—Vanadium was recovered from uranium-vanadium ores mined in Utah. In 1956 the recoverable metal content of such ores was 1.1 million pounds, a 10-percent gain over production for 1955. All Utah ores treated for vanadium recovery were shipped to mills in Colorado.

**Zinc.**—Recoverable zinc output in Utah in 1956 was 3 percent below that in 1955, whereas the value increased 8 percent as a result of the advanced price for zinc, which apparently only served to roughly stabilize output. Most of the zinc production in Utah in 1956 came from the U. S. and Lark, United Park City, and Mayflower-Park Galena mines. Other major zinc producers were the Bluestone tailing-dump operation and Eagle & Blue Bell and Ophir Unit mines.

## MINERAL FUELS

**Asphalt and Related Bitumens.**—The annual shipment of gilsonite continued to increase, as 1956 output exceeded that in the preceding year. At Bonanza, Uintah County, shaft sinking and other preparation was continued by the American Gilsonite Co. The company also began to construct a gilsonite refinery in Colorado.

To the north near Vernal the asphaltic sand deposits at Asphalt Ridge were examined to determine the economic feasibility of extracting the contained bitumens.

**Carbon Dioxide.**—Natural carbon dioxide gas was produced from the Farnham Dome field in Carbon County. The gas was transmitted to a dry-ice plant at Wellington.

**Coal.**—Output of coal from Utah mines continued to rise during 1956 and totaled 6.5 million tons compared with 6.3 million in 1955.

Digitized by Google

Demand for Utah coal at coke ovens in California and Utah totaled 2.7 million tons—an increase of 200,000 over 1955. In 1956 Utah coal delivered to California ovens totaled 1.4 million tons, the remaining 1.3 million being used at coke ovens within the State. In previous years, Utah ovens consumed the larger share of the State's output of coking coal; for example, in 1955 the comparable figures were: California, 1.1 million tons; Utah, 1.4 million tons. Utah, in turn, has been receiving increasing amounts of coking coal from other States, primarily Oklahoma and Colorado.

**TABLE 16.—Production of coal by counties, 1955–56**

(Exclusive of mines producing less than 1,000 tons)

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Average value per ton [1] | Short tons | Average value per ton [1] |
| Carbon | 4,604,169 | $6.87 | 4,937,335 | $5.46 |
| Emery | 1,492,002 | 4.86 | 1,480,145 | 4.67 |
| Garfield | 1,664 | 4.81 | 1,352 | 4.85 |
| Iron | 31,753 | 4.48 | 36,996 | 5.15 |
| Kane | 1,742 | 4.82 | 2,269 | 4.88 |
| Sevier | 54,638 | 4.97 | 46,700 | 5.65 |
| Summit | 18,506 | 3.84 | 17,367 | 4.04 |
| Uintah | 1,050 | 6.00 | ---------- | ---------- |
| Total | 6,295,524 | 6.35 | 6,522,164 | 5.28 |

[1] Value received or charged for coal f. o. b. mine, including selling cost. Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.

In 1956 coal lost its dominant position in Utah to natural gas as the chief source of heat energy used at thermal-electric plants. Consumption of coal by such plants was 306,000 tons compared with 376,000 in 1955. During 1956 the proportion of heat energy supplied by the various fuels at thermal-electric plants was: Coal, 32 percent; natural gas, 44 percent; and oil, 24 percent. In 1955 these percentages were, respectively: Coal, 40; natural gas, 35; and oil, 25.

During 1956, 49 mines (all underground) were active within the State. Average employment was 2,883 men—a slight increase over the 2,864 men employed in 1955.

**Helium.**—Government-owned helium reserves in the Harley Dome and Woodside fields in Grand and Emery Counties, respectively, have been shut in since their discovery in 1924 and 1925.

**Natural Gas and Natural-Gas Liquids.**—Marketed production of natural gas continued to rise in 1956 and totaled 17.3 million cubic feet. Important sources of natural gas were the Clear Creek field in Carbon and Emery Counties and the Clay Basin field in Daggett County. In 1956 the Joe's Valley field discovery well in Sanpete County was completed, and a confirmation well was drilled. The field was connected by pipeline to the Clear Creek system, but no further drilling was carried out.

In all, 5 gas discoveries were recorded for the year—3 less than in the previous year; successful development wells, however, numbered 13 compared with 2 in 1955.

Digitized by Google

Natural gasoline was produced from one plant in Daggett County. Natural gas for the plant was produced from the Clay Basin field.

The Pacific Northwest pipeline was completed in 1956, and plans were announced to supply several eastern Utah towns (Vernal, Moab, and Monticello) with natural gas from it.

**Petroleum.**—With discovery of substantial oil-productive capacity from the Paradox and Hermosa formations of the Paradox basin in San Juan County, 1956 may well be marked as a turning point in the history of Utah as an oil-producing State.

A total of 8 discoveries was recorded in San Juan County—the more notable being the Aneth, North Desert Creek, and East Aneth fields, each of which showed initial flows of more than 1,000 barrels daily at the discovery wells. Average daily production for the whole State in 1955 and 1956 was 6,000 barrels.

**TABLE 17.—Production of crude petroleum, 1955–56, by counties, in barrels [1]**

| County | 1955 | 1956 | Producing fields in 1956 |
|---|---|---|---|
| Duchesne | 29,000 | 18,000 | Duchesne, Flat Mesa. |
| Grand | 6,000 | 2,000 | Seiber. |
| San Juan | 154,000 | 475,000 | Aneth, Desert Creek, Boundary Butte-N. |
| Uintah | 2,038,000 | 1,774,000 | Ashley Valley, Red Wash, Roosevelt, Walker Hollow, Brennan Bottom. |
| Undistributed | | 197,000 | |
| Total | 2,227,000 | 2,466,000 | |

[1] Distribution by counties effected by use of Petroleum Information data adjusted to Bureau of Mines total.

**TABLE 18.—Wildcat and development well completions in 1956, by counties**

[Oil and Gas Journal]

| County | Oil | Gas | Dry | Total | Footage |
|---|---|---|---|---|---|
| Wildcat: | | | | | |
| Box Elder | | | 5 | 5 | 19,600 |
| Carbon | 1 | | 3 | 4 | 11,500 |
| Daggett | | | 1 | 1 | 3,300 |
| Duchesne | | | 1 | 1 | 6,400 |
| Emery | | | 4 | 4 | 16,500 |
| Garfield | | | 1 | 1 | 4,300 |
| Grand | | 1 | 19 | 20 | 61,200 |
| Millard | | | 1 | 1 | 4,200 |
| San Juan | 8 | 1 | 23 | 32 | 174,100 |
| Sanpete | | 1 | 1 | 2 | 16,900 |
| Sevier | | | 1 | 1 | 6,500 |
| Tooele | | | 1 | 1 | 2,900 |
| Uintah | 2 | 2 | 5 | 9 | 57,100 |
| Utah | | | 2 | 2 | 11,700 |
| Wayne | | | 2 | 2 | 11,500 |
| Total wildcat | 11 | 5 | 70 | 86 | 407,700 |
| Development: | | | | | |
| Emery | | 3 | | 3 | 18,700 |
| Grand | | 7 | 7 | 14 | 42,600 |
| San Juan | 21 | 1 | 3 | 25 | 142,600 |
| Sanpete | | 1 | | 1 | 7,300 |
| Uintah | 9 | 1 | 2 | 12 | 71,100 |
| Total development | 30 | 13 | 12 | 55 | 282,300 |
| Total drilling | 41 | 18 | 82 | 141 | 690,000 |

Digitized by Google

Petroleum output from Utah for the year totaled 2.47 million barrels, only an 11-percent increase over 1955. Declining production from older areas and lack of outlets for the Paradox basin crude kept production gains to a minimum. At year end 2,000 barrels of oil was being transported daily to Salt Lake City by truck and rail from the Aneth field, which was largely responsible for the increase in production from San Juan County.

Although the change in production was negligible, the increase in petroleum reserves for the State was appreciable. Estimated proved crude-oil reserves for Utah as of the first of the year totaled 35 million barrels; at year end the reserves were estimated at 139 million barrels—a fourfold increase.[6] The added reserves were entirely in the new Paradox Basin fields, and half of the State total was in the Aneth field. The Aneth field, discovered early in the year, also had the longest period of development before the close of 1956.

## NONMETALS

**Anhydrous Ammonia.**—The latest addition to the Columbia-Geneva Steel Division (United States Steel Corp.) plant near Provo was under construction during 1956. The plant will be the first in the Nation constructed by a major steel company to use coke-oven gas as a raw-material source for ammonia. When completed in 1957, this $18 million facility will produce anhydrous ammonia, nitric acid, and ammonium nitrate. The designed capacity of the plant is 200 tons per day of anhydrous ammonia, which can be sold directly, be processed further into nitric acid, or be combined with nitric acid to form ammonium nitrate. The nitric acid unit was designed to produce for the requirements of the ammonium nitrate plant. Part of the output of the acid unit will be processed into high-strength nitric acid for direct sales. The ammonium-nitrate unit consumes ammonia equal to half that of the anhydrous-ammonia production facilities so that when market demands, 100 tons per day of ammonia are converted into 200 tons per day of ammonium nitrate.

The Anaconda Co. signed a contract to purchase substantial quantities of anhydrous ammonia from this plant to be used at Anaconda, Mont., for production of ammonium phosphate fertilizer.

**Cement.**—Production of cement continued to rise in 1956 as a direct result of the activities of the construction industry, and shipments during the year increased 5 percent compared with 1955. Because of this larger demand, the two 400-foot kilns of Ideal Cement Co. and the two 185-foot kilns used by the Portland Cement Co. of Utah were operated 330 and 326 days, respectively, compared with 301 and 305 days in 1955. These companies continued to mine the bulk of their raw materials (namely, shale and limestone). On the other hand, sand, sandstone, gypsum, iron ore, slag, and miscellaneous other raw materials were purchased locally or from out-of-State sources. Shipments of types I, II, III, V, oil-well, waterproof-portland, and masonry cements were reported in 1956, and the States to which this material was shipped were Arizona, California, Colorado, Idaho, Illinois, Minnesota, Nevada, North Dakota, Utah, Washington, and Wyoming.

[6] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 157.

Digitized by Google

**Clays.**—Mining of halloysite by the Filtrol Corp. at the Dragon mine near Eureka composed a major part of the total value of this mineral commodity in Utah during 1956. The demand for halloysite by the petroleum-refining industry in its catalytic cracking units accounted for a portion of the increase in 1956 sales of clays; however, shipment of fuller's earth, bentonite, and shale for brickmaking also gained. These increases resulted from a stronger demand for clay as a building material.

Four established brick plants continued to be operated in the State during 1956—2 at Salt Lake, 1 at Ogden, and 1 at Provo. The United Brick Co. constructed a $100,000 brick plant at Lehi to produce all types of common building and face brick, using Utah County clays.

With the exception of 57,000 tons of fire clay produced in Utah County by Utah Fire Clay Co., R. D. Wadley Clay Co., and Western Fire Clay Co., and halloysite in Juab County, the bulk of the State output of clays was classified as miscellaneous clay. Producers of the latter type of clay were Interstate Brick Co., Florence Powell, Loyd R. Stubbs, and Utah Fire Clay Co. in Utah County, Interstate Brick Co. in Morgan County, Utah Fire Clay Co. in Summit County, and Harrisville Brick Co. in Weber County. Bentonite and fuller's earth were mined by Western Clay & Metals Co. in Sevier County. During 1956 the Interstate Brick Co. completed constructing a $500,000 automatic tunnel kiln at its Salt Lake City brick plant.

An average of 100 men was employed in clay mining in Utah during 1956, and the number of days of employment averaged 237.

**Fluorspar.**—Notwithstanding the general downward trend of fluorspar mine production in the United States, the output of this commodity reached 10,600 tons in 1956 compared with 7,300 in 1955 and 4,400 in 1954. Before the Government purchasing program for Metallurgical-grade fluorspar was activated, the only market available to local producers was the steel plant at Geneva and to a lesser degree brokers for West Coast consumers. However, the establishment of a buying program appeared to have aided the fluorspar industry, in that it provided a local outlet for mine production and prevented the closing of mines, as evidenced by increased shipments to the Government stockpile.

The principal mine operators in 1956 were Willden Bros. (Lost Sheep mine) and Chesley & Black (Fluorine Queen). Shipments of Metallurgical-grade fluorspar were also reported by George Spor & Sons (Fluoride mine), Bell Hill Mining Co. (Bell Hill mine), and Fred Staats (Staats Fluorspar mine).

**Gem Stones.**—The value of gem and ornamental stones collected in Utah rose from $6,000 in 1955 to $10,000 in 1956. As 1955 was the first year in which a measure of value was obtained on a basis of a questionnaire survey, no correlation can be made between value figures for this period (1955–56). A wide variety of gem and ornamental stones was reported from many counties. In terms of value, agate headed the list of important stones, followed by onyx, petrified wood, and obsidian.

**Gypsum.**—In 1956, as in 1955, all gypsum produced in Utah came from open pits near Sigurd, Sevier County, operated by United

Digitized by Google

States Gypsum Co. and Western Gypsum Co. As a result of a temporary decline in the demand for wallboard, plaster, Keene's cement, and other building material, output of crude gypsum in 1956 dropped 23 percent from the 1955 output.

A calcining plant was operated at Sigurd by Western Gypsum Co. Coal was used as a fuel in operating 3 kettles and 3 Keene calciners, and the calcined product was used for industrial purposes, including pottery, dental and orthopedic plaster, industrial molding, and building products.

**Lime.**—Lime output in Utah during 1956 rose to 55,110 tons, a 42-percent increase over 1955. This gain in sales can be attributed to a greater need for lime in processing copper, uranium, and lead ores. Two plants in Utah, owned by Utah Lime & Stone Co. at Grantsville and Lakeside Lime & Stone Co. at Lehi, produced lime for the open market. The third plant was owned by the Utah Copper Division of Kennecott Copper Corp. at Magna; except for a small quantity of quicklime sold, the entire output from this 49,500-ton-per-year facility was hydrated to milk of lime and consumed by the company in treating copper ore. Two rotary kilns and 2 continuous hydrators were operated during 1956, using natural gas as a fuel. The crushed limestone employed as a plant feed was quarried by the Utah Lime & Stone Co. Eleven shaft kilns and 2 batch-type hydrators using coke and fuel oil as fuel were operated by the 2 open-market lime producers.

**Perlite.**—The sale of the Utco Products Co. mine in Beaver County and expanding plant at Salt Lake City ended the history of the last of the old time operating companies. Both mine and mill were purchased on August 1 by Acme Lite Wate Products, Inc., of Salt Lake City. This new operator discontinued mining at the Beaver County deposit and obtained crude ore for its plant from Nevada mines.

Before August 1, Utco Products Co. mined 2,300 tons of crude perlite, which was consumed at its expanding plant. No other mine production was reported during 1956. Total expanded production during the year reached 3,470 tons valued at $159,000. Shipments of expanded perlite were reported by Acme Lite Wate Products, Inc., from the Utco mill, as well as a Salt Lake City facility leased from Combined Metals Reduction Co. and Utco Products Co. from the Utco mill before it was sold.

**Phosphate Rock.**—Output of phosphate rock in Utah during 1956 declined somewhat from the 1955 high, but no special significance is attached to the decrease. Demand for phosphate rock, mainly as a fertilizer, remained strong. The San Francisco Chemical Co. was the only mine operator in the State, and development was conducted on 3,000 acres of phosphate reserves 14 miles northeast of Vernal during the year. This deposit is part of a 15,000-acre tract held by the Humphries Phosphate Co. San Francisco Chemical Co. reportedly planned to explore and develop the properties, with a possibility of ultimately constructing an upgrading mill and mining the rock by open-pit methods. All Utah mine output was shipped to Leefe (Wyo.) for processing. During 1956 San Francisco Chemical Co. was constructing a 1,000-ton-per-day beneficiating plant at Leefe, which, when completed, will enable the company to handle greater quantities of both Utah and Wyoming rock. Reportedly, the National Farmers Union planned to begin mining of its Cheney phosphate properties

Digitized by Google

in Rich County. Also under consideration was construction of a triple superphosphate plant near the mine.

Western Phosphates, Inc., joint subsidiary of Stauffer Chemical Co., American Smelting and Refining Co., and Kennecott Copper Corp., continued its general expansion and improvement program for increased production of triple superphosphate, ammonium phosphate, and (eventually) potash-containing fertilizer products. A boost of 10,000 to 70,000 tons annually in capacity will result. The program will continue well into 1958.

**Potash.**—Combined sales of potash and alunite in 1956 were 5 percent greater than in 1955, but output was still less than in 1954. The increase in 1956, compared with 1955, can be attributed mainly to a year of uninterrupted work by Bonneville, Ltd., and the production of alunite by the Calunite Corp. The muriate of potash (95–98 percent KCl) was recovered at the Bonneville, Ltd., plant near Wendover from the treatment of potassium-bearing brines of Salduro Marsh on the Bonneville salt flats. The company completed construction during 1956 of a $250,000 "prilling" plant (fusing small salt crystals and producing granulated potash to customers' specifications).

Delhi-Taylor Oil Co., which was engaged in extensive exploration for potash reserves in the Seven Mile Anticline area near Moab, Grand County, extended its holdings to almost 30 square miles of potash leases. Exploratory drilling greatly increased the proved and probable reserve, which, according to company reports, was three times greater than in 1955.

The Alunite Corp. of Utah installed a hammer screen and elevators at its Marysvale mill to provide a capacity of 10 tons of crushed rock per hour compared with the former capacity of only 3 tons. The firm also announced plans in June for further expansion of its mill and construction of a $35,000 plant at Salt Lake City for bagging its fertilizer product made from crushed alunite. Western Gold & Uranium, Inc., operated the Applegarth mine near Marysvale, producing 50 tons of crude alunite for testing purposes.

**Pumice.**—Increased production of pumice, pumicite, and volcanic scoria in Utah in 1956 indicated more activity than this branch of the mineral industry has experienced in many years. Total sales in 1956 reached 45,000 tons compared with 2,000 tons in 1955. This marked advance was due almost entirely to the mining of scoria at the Red Dome claims in Millard County by Christensen Construction Co. The next major producer was the Utah Lavalite, Inc., also in Millard County, followed by William H. Prince & Sons Block Co., (Utah County) and Harbolite Corp. (Tooele County). The bulk of total sales was used as concrete aggregate, although Utah Lavalite, Inc., reported as uses cleansing and scouring compounds and hand soaps, Harborlite Corp., filter aids and filler; and Christensen Construction Co., roofing aggregate.

**Salt.**—The most significant development in Utah's salt industry in several decades was highlighted in June 1956, when the gates were opened to permit brine from the Great Salt Lake to flow into a million-dollar salt-pond system constructed near Stansbury Island, Tooele County, by Chemical Salt Production Co. It will be 3 or 4 years before the pond system actually begins to produce, but completion of the ponds marks the beginning of a chemical-salt industry in the

465877—58——73

Digitized by Google

State. Ultimate production will go to chemical plants in the Tacoma (Wash)–Portland (Oreg.) area for use in producing chlorine, caustic soda, and anhydrous ammonia.

Salt output in 1956 dropped to 184,000 tons, a 6-percent decrease from 1955, but no special significance is attached to the decline. The production of sodium chloride by solar evaporation from lake brines continued to supply the bulk of the State output; rock salt accounted for the remainder. The Morton Salt Co. (Salt Lake County) was the major producer and harvested solar-evaporated salt. The Deseret Salt Co. and Stansbury Salt Co., Inc. (Tooele County), were also solar-evaporation producers. Rock-salt output was reported by Poulson Bros. Salt Co. (Sevier County) and Royal Crystal Salt Co. (Sanpete County); the latter company was the principal rock-salt producer. Some of the more important uses reported by producers were as cattle feed, in canning, for human consumption, and in the processing of uranium ores.

**Sand and Gravel.**—The total output of sand and gravel in 1956 rose to 5.8 million tons, a 13-percent gain over 1955. The stimulus for this increased production was highway-construction contracts let by the Utah State Road Commission as a result of the Federal highway program, which gained momentum during 1956, and a strong demand created by the building trades. Of the total output in 1956, 3.6 million tons valued at $2.8 million was produced by individuals or firms for commercial use, and 2.2 million tons with a value of $1.7 million was quarried by private contractors and construction crews of county and State highway departments. Demand for commercial sand and gravel was highest in the more populated regions of the State.

Salt Lake County was the leading producing area, with 2.3 million tons or 39 percent of the total output, followed by Davis, Box Elder, Utah, and Weber Counties; in all, sand and gravel was produced in 24 of the 29 counties in Utah. Washed, screened, or otherwise prepared material comprised 81 percent of the total commercial output, and 66 percent of the Government-and-contractor production was processed; only 12 percent of the commercial sand and gravel was transported by railroad—trucks carried the remainder.

**Stone.**—Crushed limestone used in cement, for flux, concrete aggregate, and sugar refining, and as rock dust for coal mines again constituted the most important type of stone produced in Utah during 1956. Although limestone resources are virtually unlimited in Utah, output was held to 1,694,000 tons during 1956. Production of all types of stone in 1956 reached 2,322,000 tons valued at $3,298,000—21 percent more than 1955. Crushed sandstone was the second-ranking stone, with an output of 319,000 tons. Crushed miscellaneous stone was third, with 306,000 tons, followed by dimension sandstone (2,700 tons).

The leading producers of limestone were Columbia-Geneva Steel Division, United States Steel Corp., Ideal Cement Co., Portland Cement Co. of Utah, American Smelting and Refining Co. (oolitic limesand), Lakeside Lime & Stone Co., and Utah Lime & Stone Co. The major producers of commercial sandstone were Murray Refractories Co. and General Refractories Co. Utah Construction Co. was the principal producer of noncommercial crushed sandstone. Morrison-Knudsen Co., Inc., accounted for all the miscellaneous-stone output.

Digitized by Google

**TABLE 19.—Sand and gravel sold or used by producers, 1955–56, by classes of operation and uses**

| Class of operation and use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Total | Average per ton |
| **COMMERCIAL OPERATIONS** | | | | | | |
| **Sand:** | | | | | | |
| Molding | (1) | (1) | | (1) | (1) | |
| Structural | 807,303 | $609,762 | $0.76 | 878,000 | $650,500 | $0.74 |
| Paving | 267,778 | 216,471 | .80 | 298,000 | 304,000 | 1.02 |
| Grinding and polishing | | | | (1) | (1) | |
| Blast | (1) | (1) | | (1) | (1) | |
| Fire or furnace | 25,000 | 27,500 | 1.10 | 20,000 | 10,000 | .50 |
| Engine | (1) | (1) | | (1) | (1) | |
| Railroad ballast | (1) | (1) | | | | |
| Undistributed | 27,132 | 32,685 | 1.20 | 60,500 | 82,000 | 1.36 |
| Total sand | 1,127,213 | 886,418 | .79 | 1,256,500 | 1,046,500 | .83 |
| **Gravel:** | | | | | | |
| Structural | 1,011,960 | 790,601 | .78 | 811,000 | 613,500 | .76 |
| Paving | 648,040 | 458,727 | .71 | 1,221,500 | 976,000 | .80 |
| Railroad ballast | 106,018 | 33,020 | .31 | 69,000 | 41,000 | .59 |
| Undistributed | 4,267 | 4,054 | .95 | 270,500 | 146,200 | .54 |
| Total gravel | 1,770,285 | 1,286,402 | .73 | 2,372,000 | 1,776,700 | .75 |
| Total sand and gravel | 2,897,498 | 2,172,820 | .75 | 3,628,500 | 2,823,200 | .78 |
| **GOVERNMENT-AND-CONTRACTOR OPERATIONS** | | | | | | |
| **Sand:** | | | | | | |
| Structural | | | | 71,000 | 116,000 | 1.63 |
| Paving | 74,973 | 25,469 | .34 | 182,500 | 125,500 | .69 |
| Total sand | 74,973 | 25,469 | .34 | 253,500 | 241,500 | .95 |
| **Gravel:** | | | | | | |
| Structural | 186,656 | 50,407 | .27 | 298,000 | 256,000 | .86 |
| Paving | 1,999,138 | 1,060,584 | .53 | 1,655,500 | 1,155,000 | .70 |
| Total gravel | 2,185,794 | 1,110,991 | .51 | 1,953,500 | 1,411,000 | .72 |
| Total sand and gravel | 2,260,767 | 1,136,460 | .50 | 2,207,000 | 1,652,500 | .75 |
| **ALL OPERATIONS** | | | | | | |
| Sand | 1,202,186 | 911,887 | .76 | 1,510,000 | 1,288,000 | .85 |
| Gravel | 3,956,079 | 2,397,393 | .61 | 4,325,500 | 3,187,700 | .74 |
| Grand total | 5,158,265 | 3,309,280 | .64 | 5,835,500 | 4,475,700 | .77 |

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.

**Sulfuric Acid.**—Garfield Chemical & Manufacturing Corp., a jointly owned facility of American Smelting and Refining Co. and Kennecott Copper Corp., expanded production of sulfuric acid to 1,100 tons a day by constructing its fifth contact-process sulfuric-acid unit. The plant is at the Garfield smelter of American Smelting and Refining Co. and is operated by ASARCO personnel. It uses as raw material sulfur-dioxide gas produced by the Garfield smelter copper-converter operation. Output of the new plant was expected to go entirely to the growing Intermountain-area industry. Utah ranked second among the States producing byproduct sulfuric acid (Pennsylvania was first) and furnished approximately one-quarter of the total United States output of this commodity.

Digitized by Google

**Talc.**—Montana and California mines continued to supply the crude talc processed at the Ogden mill of Tri-State Minerals Co. during 1956. The finished product was used in paints, ceramics, textiles, rice polishing, and other applications.

**Vermiculite.**—In 1956, as in 1955, no crude vermiculite was mined in Utah, but a plant producing exfoliated vermiculite was operated by Vermiculite-Intermountain, Inc. The end product, marketed under the trade name Zonolite, was used for insulation.

## REVIEW BY COUNTIES

**Beaver.**—The value of mineral output in Beaver County increased from $23,000 in 1955 to $122,000 in 1956. An advance in copper production in 1956 explained most ($73,000) of this county increase. Sand and gravel output in 1956 was valued at $18,000 compared with none in 1955.

Gold, silver, copper, lead, and zinc came from 10 active mines in Beaver County in 1956. The combined value of these 5 metals ($90,000) composed 74 percent of the total value of mineral production. Most of the output of gold, silver, and copper was from ore mined by Norman Rogers Mining Co. from the Cupric (Newhouse) mines. Peter S. Martin, who operated the Last Chance mine, was the major lead producer in the county.

The North Star Metals, Inc., was the sole producer of tungsten in the county. The ore from the Old Hickory mine was shipped to Salt Lake Tungsten Co. for concentration and subsequent sale to the GSA. The final concentrate—1.18 short tons averaging 66.46 percent $WO_3$—was valued at $4,700.

Nonmetal production in 1956 totaled $27,500 and consisted of sand and gravel, perlite, and gem or ornamental stones. The 22,000 tons of paving gravel was prepared by L. A. Young Co. and Vernal Sand & Gravel Co. in connection with contracts with the Federal Bureau of Public Roads. Utco Products Co. operated its open-pit perlite mine for a short period during the first half of the year. The company sold the mine to Acme Lite Wate Products, Inc., which did not work the mine after buying it. The collection of gem and ornamental stones consisted of 1,000 pounds of obsidian reported by Dog House Rock Shop.

Shipments of uranium ore were made during the first 6 months of the year from the Monarch No. 1 claim by Fred Staats.

**Box Elder.**—Sand and gravel and stone were the more important mineral commodities produced in Box Elder County during 1956, and the increased demand for construction materials raised the total value of mineral production for the county to $775,400 compared with $181,000 in 1955. The bulk of the output of sand and gravel was produced by Fife Rock Products Co., Inc., Allen Hunsaker, and Morrison-Knudsen Co., Inc., for the Southern Pacific Railroad Co. This commercial output consisted of structural sand, fill sand, and structural, paving, and railroad (trestle-fill) gravel. Government-and-contractor production was reported by Germer, Abbott & Waldron, Union Construction Co., and L. A. Young Co. as contractors for the Utah State Road Commission and construction crews of the county highway department. Quarried stone consisted of crushed miscel-

Digitized by Google

laneous stone produced by Morrison-Knudsen Co., Inc., for the Southern Pacific Railroad Co. (used as trestle fill) and crushed sandstone produced by General Refractories Co. (used in refractory products).

Two firms—A. C. D. Uranium & Fertilizer Co. and Consolidated Mines & Milling Co.—mined tungsten ore from deposits in the county. The ore was treated at custom mills and plants and the concentrate sold to the Government. Small quantities of silver, copper, lead, and zinc were recovered from ore mined by Jesse C. Clark and by Doran Hunt.

**Cache.**—The mineral products of Cache County during 1956 were sand and gravel and stone. Stone output was valued at $293,000 and consisted of 180,000 tons of crushed sandstone quarried by the county highway department and crushed limestone produced by Le Grand Johnson Corp. The sandstone was used in highway surfacing and

**TABLE 20.—Value of mineral production in Utah, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Beaver | $23,196 | $122,242 | Copper, sand and gravel, perlite, tungsten concentrate, silver, lead, gem stones, gold, zinc. |
| Box Elder | 180,725 | 775,421 | Sand and gravel, stone, tungsten concentrate, lead, zinc, silver, copper. |
| Cache | 385,276 | 450,186 | Stone, sand and gravel. |
| Carbon | 32,265,893 | 27,032,512 | Coal, sand and gravel, carbon dioxide. |
| Daggett | 8,699 | ---- | |
| Davis | 404,804 | 485,319 | Sand and gravel, stone, copper, silver. |
| Duchesne | 69,479 | 40,075 | Petroleum. |
| Emery | [1] 7,291,266 | 6,979,512 | Coal, sand and gravel, gem stones. |
| Garfield | 57,862 | 48,656 | Sand and gravel, coal, gem stones. |
| Grand | [1] 30,531 | 63,379 | Sand and gravel, petroleum, copper, gem stones, silver, lead. |
| Iron | 24,884,180 | 27,784,673 | Iron ore, coal, sand and gravel, stone. |
| Juab | [1] 4,542,011 | [1] 3,821,918 | Clays, lead, silver, zinc, fluorspar, gold, stone, copper, tungsten concentrate. |
| Kane | 8,496 | 36,315 | Sand and gravel, coal, gem stones. |
| Millard | [1] 124,594 | [1] 385,811 | Pumice, sand and gravel, tungsten concentrate, gem stones. |
| Morgan | 6,245,856 | 6,915,427 | Cement, stone, clays, sand and gravel. |
| Piute | [1] 104,900 | 20,797 | Potash, silver, copper, gold, lead, zinc. |
| Rich | [2] | 774,585 | Phosphate rock, sand and gravel. |
| Salt Lake | 226,644,825 | 269,428,127 | Copper, molybdenum, gold, lead, zinc, silver, sand and gravel, cement, salt, lime, stone. |
| San Juan | 368,747 | 1,175,425 | Petroleum, sand and gravel, copper, silver, gem stones. |
| Sanpete | 54,059 | 41,748 | Salt, sand and gravel. |
| Sevier | [1] 1,289,933 | 1,106,363 | Gypsum, coal, clays, sand and gravel, salt, silver, zinc, gold, lead. |
| Summit | 1,220,192 | 5,569,691 | Zinc, lead, silver, copper, sand and gravel, gold, stone, coal, clays. |
| Tooele | 3,696,655 | 4,027,627 | Lead, potash, zinc, salt, lime, silver, copper, gold, stone, pumice, tungsten concentrate, gem stones. |
| Uintah | 4,775,601 | 3,983,275 | Petroleum, sand and gravel. |
| Utah | 1,848,726 | 2,575,985 | Stone, sand and gravel, clays, lime, silver, lead, zinc, copper, gold, pumice, gem stones. |
| Wasatch | 7,734,544 | 2,955,678 | Zinc, lead, gold, copper, silver, sand and gravel. |
| Washington | 158,746 | 134,223 | Copper, sand and gravel, silver, stone, lead, gem stones, gold. |
| Wayne | 150 | 5,200 | Sand and gravel, gem stones. |
| Weber | 262,370 | [1] 304,700 | Sand and gravel, stone, clays. |
| Undistributed | 8,299,122 | [3] 30,817,650 | |
| Total [4] | [5] 331,929,000 | 396,942,000 | |

[1] Excludes value of manganese ore sold and blended at Government low-grade stockpiles for future beneficiation.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes uranium, gilsonite, natural gas, vanadium, petroleum, sand and gravel, natural gasoline, and gem stones that cannot be assigned to specific counties, and values indicated by footnote 2.
[4] Total has been adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.
[5] Figure excludes uranium; value of uranium for 1955 was not released by the Atomic Energy Commission.

Digitized by Google

the limestone in sugar refining. Sand and gravel production, valued at $157,000, was comprised of paving gravel mined and prepared by construction crews of the State and county highway departments and Olof Nelson Construction Co. and Wheelwright Construction Co. as contractors for the Utah State Road Commission. Commercial structural sand and gravel output was reported by Johnson Ready Mix Concrete Co., Kloepfer Sand & Gravel Co., Jack B. Parson Construction Co., and Savage Sand and Gravel Co.

**Carbon.**—Carbon County coal production rose from 4.7 million tons to 4.9 million in 1956. A total of 27 mines was active during the year, and employment averaged 2,255 men.

In late January 1956 the Hi-Heat Coal Co. ceased operations and abandoned the Rains No. 3 mine. The reason given for terminating operation was reported to be loss of market to natural gas in the Pacific Northwest.

At Hiawatha the United States Fuel Co. installed additional preparation and stockpiling facilities. Equipment for transferring material to and from stockpiles was designed to permit greater flexibility in operating the mine and preparation plant. In addition, a resin flotation unit, designed to recover 4 million pounds of resin annually, was completed and placed in operation in November. The resin recovered was shipped to Bauer in Tooele County.

The Lion Coal Co. (Wattis) placed in operation a new Parry drier in August 1956, designed to remove surface moisture from minus-1½-inch coal at a rate of 150 tons an hour.

During 1956 Knight Ideal Coal Co. contracted for installation of a 150-ton-per-hour dense-medium cleaning plant at the Knight mine.

Natural gas was produced from the Clear Creek field and piped to consuming markets in the Salt Lake City area. No development work was reported in the Carbon County portion of the field during the year. Carbon dioxide gas was produced from the Farnham dome and processed in the dry-ice plant operated by Carbon Dioxide & Chemical Co. at Wellington.

Sand and gravel output consisted of 38,000 tons of paving gravel valued at $39,000. This material was mined by construction and maintenance crews of the Utah State Road Commission in connection with county road projects.

**Daggett.**—Natural gas from the Clay Basin field was processed at a plant operated by the Mountain Fuel Supply Co. to extract natural gasoline and then shipped through the company pipeline to Salt Lake City.

**Davis.**—Of the $485,300 worth of mineral commodities produced in Davis County during 1956, $484,000 represented the value of sand and gravel production. Demand by the construction industry, particularly for commercial use, stimulated the sand and gravel industry, and the output of structural and paving sand and structural and paving gravel rose to 735,000 tons in 1956 compared with 530,000 in 1955. The principal commercial operators were Foss Lewis Sand & Gravel Co., White Hill Sand & Gravel Co., and Clarence Waterfall. Government-and-contractor output was reported by Wheelwright Construction Co. as contractor for the Utah State Road Commission. Construction activities also were responsible for the production of 590 tons of crushed limestone by United Concrete Pipe

Digitized by Google

Corp. which conducted quarrying operations for the Federal Bureau of Reclamation.

Phillips Petroleum Co. and Western States Refining Co. operated refineries at Woods Cross and North Salt Lake, respectively. Construction of additional facilities at both plants was completed in the fall of the year.

**Duchesne.**—Sources of petroleum production were the Duchesne and Flat Mesa field. Output from the Duchesne field continued to decline falling to half of 1955 output; the downward trend accounted for the drop in county production.

**Emery.**—The county was the second most important in uranium production in the State; output came primarily from the San Rafael swell and Green River areas. During the first 6 months of the year shipments of uranium ore were made from 58 properties and totaled 65,400 tons at an average grade of 0.28 percent contained $U_3O_8$. Major properties, in terms of shipments for the period, were as follows:

| Property: | *Operator* | *Locality* |
|---|---|---|
| AEC No. 3 | Consolidated Uranium Mines, Inc. | Temple Mountain. |
| AEC No. 8 | ----do | Do. |
| AEC No. 11 | ----do | Do. |
| AEC No. 12 | ----do | Do. |
| Delta | Hidden Splendor Mining Co. | San Rafael, South. |
| Dirty Devil No. 3 | Five States Uranium Corp. | Do. |
| Incline No. 1 | Four Corners Uranium Corp. | Green River. |
| Incline No. 2 | ----do | Do. |
| Incline No. 3 | ----do | Do. |
| Incline No. 5 | ----do | Do. |
| Incline No. 6 | ----do | Do. |
| Incline No. 8 | ----do | Do. |
| Vanadium King No. 1. | Uranium Industries, Inc. | Temple Mountain. |

These 13 properties produced 91 percent of the county total for the 6-month period.

Four Corners Uranium Corp. operated nine properties in the Green River area. In August the corporation signed a contract with Vitro Uranium Co., operator of the Salt Lake City mill, to deliver all of the output of the corporation properties in the Green River area to the Vitro mill. The contract called for delivery of a minimum of 3,000 tons of uranium ore per month, with a maximum of 12,000 tons per month. A similar agreement was made in 1955 between the Hidden Splendor Mining Co. (operator of the Delta mine) and Vitro which called for delivery of 5,000 tons per month, with a maximum of 9,000 tons.

Production of coal remained essentially the same as in 1955. Fifteen mines were reported active, and employment averaged 584 men during the year.

Natural gas was produced from the Clear Creek field in Emery and Carbon Counties. Two successful development wells were completed in the Emery County portion of the field by Three States Natural Gas Co. A successful development well was also drilled by the same company in the Flat Canyon field.

Sand and gravel produced in Emery County during 1956 reached 96,000 tons valued at $62,000. Output consisted of 93,000 tons of

Digitized by Google

structural and paving gravel produced by Dudley, Jensen & Johnson for the Federal Bureau of Public Roads and construction crews of the Emery County Highway Department, and 3,000 tons of paving gravel prepared by W. W. Clyde Construction Co. for commercial use.

One thousand pounds of agate was collected in the Castledale region.

**Garfield.**—Shipments of uranium ore were reported from 45 properties during the first half of 1956. Total quantity of ore shipped during the period was 3,232 tons averaging 0.35 percent contained $U_3O_8$. The Trachyte No. 18 claim (operated by the Vanadium Corp. of America) and the Section 36 property (Lone Star Mining & Development Corp.) were the leading producers during the period. Both properties were on the eastern flank of the Henry Mountains near and to the north of Trachyte Wash.

Although construction materials again dominated the nonmetal portion of the mineral industries of Garfield County in 1956, a shift in the location of highway construction caused a significant decline in the value of these materials. Total value of all minerals in 1956 fell to $48,600, a 16-percent decline from 1955. Sand and gravel (47,000 tons) was mined by the Union Construction Co. for the Federal Bureau of Public Roads and by a contractor for the Utah State Road Commission.

No stone was produced during the year, but $2,100 worth of onyx and petrified wood was collected by the Dog House Rock Shop and Fawcett Hobby Shop.

Coal was produced in Garfield County in 1956 from the Alvey mine operated by Lovell M. Twitchell.

**Grand.**—Grand County uranium production for the first 6 months of the year totaled 12,473 tons of ore averaging 0.26 percent contained $U_3O_8$. This output was derived from 68 properties, the more productive of which were as follows:

| Property: | *Operator* | *Locality* |
|---|---|---|
| Blackstone No. 6 | E. E. Lewis Associates | Yellow Cat. |
| Cane Creek School Section 3. | Climax Uranium Co | Cane Canyon. |
| Cedar Point No. 2 | Frontier Mining Corp. and Great Frontier Mining Co. | Beaver Mesa. |
| Elva M No. 2 | Union Carbide Nuclear Co | Polar Mesa. |
| FW No. 3 | do | Do. |
| Parco No. 23 | Utah Alloy Ores, Inc | Yellow Cat. |
| SR Fraction | Union Carbide Nuclear Co | Polar Mesa. |
| Utah State Lease No. 3971. | Norbute Corp | Yellow Cat. |

These 8 properties produced 63 percent of the county total for the half-year period.

In October, Uranium Reduction Co. completed constructing a 1,500-ton-per-day uranium mill at Moab, and in November the first concentrate was shipped to the AEC at Grand Junction, Colo. The plant utilized acid-leach and resin-in-pulp circuit to process ores from the Big Indian district. Reported cost of the new mill was $8 million.

Sand and gravel was produced in Grand County by D. W. Brimhall and H. J. Wimmer, contractors for the Federal Bureau of Public Roads, who mined 75,500 tons of paving gravel; all of it was prepared and used for highway construction.

Digitized by Google

Agate (1,400 pounds gathered by Dale & Della Hicks and Stoby's Rock & Curio Shop) was the only ornamental stone collected in the county in 1956.

In the San Arroyo field a gas discovery was credited to Sinclair Oil & Gas Co., which found production from the Dakota formation a new productive horizon for the field. The company also completed one successful development well in the field. Six other successful development wells were drilled in the Bar-X area by The American Metal Co., Ltd., and by Burton W. Hancock. The county source of petroleum was the Sieber field.

The recorded production of 121 ounces of silver, 2 tons of copper, and less than 1 ton of lead in the county in 1956 was recovered from 124 tons of silver ore mined from 3 properties, Azurite No. 1, Blue Moon, and Kopper King, and shipped directly to the American Smelting and Refining Co. smelter at Garfield.

**Iron.**—All of the iron-ore shipments from Utah in 1956 originated in Iron County. The value of these 1956 shipments ($27.5 million) was $2.8 million, (11 percent) above 1955 and represented 99 percent of the total value of mineral output in the county. All of the ore (4 million tons), except 8,700 tons used for paint pigment, was used in making pig iron and steel. Four individuals or companies—Helene E. Beatty, Colorado Fuel & Iron Corp., Columbia Iron Mining Co., and The Utah Construction Co.—mined ore from 10 mines in the county in 1956.

Coal output from 3 Iron County coal mines (Jones-Bullock, Tucker, and Webster) totaled 37,000 tons in 1957, a 16-percent gain over the preceding year; average employment for the year was 17 men.

The value of nonmetal output in 1956 rose to $86,000 compared with $54,000 in 1955 owing to the increased quantity and value of sand and gravel produced. V. C. Mendenhall and Whiting & Haymond supplied the Government-and-contractor output and Cedar Silica Sand Co. the commercial production.

Commercial-stone production consisted of 1,000 tons of crushed sandstone quarried by Willard B. Thompson and used as roofing granules and 400 tons of dimension sandstone produced by the Bear Valley Stone Corp. and used as building stone.

**Juab.**—The total value of mineral production in Juab County declined from $4.5 million in 1955 to $3.8 million in 1956. A substantial drop in the value of lead, zinc, and silver output was partly balanced by an increased value of clays and fluorspar output.

Clays, fluorspar, and stone comprised the nonmetal group of mineral commodities produced in the county in 1956; despite lack of any sand and gravel and gem-stone production, the total value for this group rose to $2 million compared with $1.5 million in 1955. This advance can be attributed to gains in output of clay and fluorspar. Halloysite from the Dragon mine of Filtrol Corp. accounted for all the clay, whereas fluorspar was mined by five operators. Shipments of Metallurgical-grade fluorspar increased 44 percent over 1955, and Chesley & Black (Fluorine Queen mine) and Willden Bros. (Lost Sheep mine) were the principal mine operators. Crushed sandstone used in refractory materials continued to be mined by General Refractories Co. and Murray Refractories Co. Both firms consumed all their mine production at plants near the mines.

Digitized by Google

Curtailed operations in 1956 at the Chief No. 1 mine by the Chief Consolidated Mining Co.—one of the 1955 major gold, silver, lead, and zinc producers in Utah—was the main reason for the reduced metal output in the county in 1956. The Eagle & Blue Bell mine (an active producer throughout the last half of 1955), operated by Eagle & Blue Bell Mining Co.—a subsidiary of Chief Consolidated Mining Co.—was the principal metal producer of Juab County in 1956. In terms of output, it ranked fourth in gold and lead and fifth in zinc in the State in 1956. The Plutus Mining Co. (a 93-percent owned subsidiary of Chief Consolidated Mining Co.) operated the Plutus mine, another of the principal metal producers in the county in 1956.

In addition to the Chief No. 1, Eagle & Blue Bell, and Plutus mines, 15 other mines in Juab County produced varying quantities of gold, silver, copper, lead, and zinc. Of these mines the Vagabond-Sinabad (Temple Mountain Uranium Co.), Centennial-Beck-Victoria (United States Smelting Refining and Mining Co.), and Mammoth (Mammoth Mining Co.) were the major producers.

Two companies (Alta Uranium Mills, Inc., and Desert Mountain Mills, Inc.) mined tungsten ore from deposits in Juab County and shipped it to Salt Lake Tungsten Co., Salt Lake City, for treatment. The concentrate produced from the ore was purchased by the Government.

Manganese ore was shipped from the Black Boy mine by L. J. Price and from the Staats Manganese mine by Fred Staats to the Government (GSA) Butte (Mont.) Purchase Depot. This material was marketed under the low-grade-manganese, ore-purchasing program and will be credited as production in the year a useful product is shipped from the depot.

**Kane.**—Sand and gravel produced in Kane County in 1956 amounted to 30,000 tons of paving gravel valued at $25,000. This material was prepared by a contractor for the Utah State Road Commission.

Agate and petrified wood valued at $310 were collected by the Dog House Rock Shop and the Fawcett Hobby Shop.

Coal was produced from the Smirl-Alton mine operated by William J. Smirl.

During the first 6 months of the year, test shipments of uranium ore were made from the Radiant claim by Lyman & Farnsworth and from the Young No. 1 claim by the Black Mountain Uranium Co.

**Millard.**—Construction materials (namely, sand and gravel and pumice) made up 93 percent of the total value of all minerals produced in Millard County in 1956. The total value of mineral output in the county rose to $385,800—a threefold increase over 1955. This gain in value was accomplished despite a significant decrease in the value of tungsten production. Operation of the Red Dome claims near Fillmore by Christensen Construction Co. accounted for the major portion of the pumice-pumicite production, although Utah Lavalite, Inc., produced a small quantity of pumice from claims near Milford. Highway-construction activities of the Utah State Road Commission resulted in a contract let to Wilkinson Construction Co. that entailed producing 1,000 tons of paving gravel. In conjunction with roadwork, construction crews of the commission mined 45,000 tons of paving gravel.

Digitized by Google

Obsidian from the Black Rock region was the only ornamental stone collected in 1956. The Fawcett Hobby Shop and Harold Shugart reported acquiring $240 worth of this material.

Three mines in the county produced two-thirds of the tungsten output in the State in 1956. The most important producer—Mid-States Development, Inc.—sold its ore to the Union Carbide Nuclear Co. (Bishop, Calif.), which treated the ore and sold the concentrate to GSA.

Willden Bros. shipped a substantial quantity of manganiferous ore (averaging 26.9 percent manganese) from the Mizpah mine in Millard County to the Government (GSA) Butte (Mont.) Purchase Depot in 1956.

**Morgan.**—Nonmetals of the construction-material type were the only commodities reported by the mineral industries of Morgan County in 1956. Cement again ranked as the most important, and operation of the Union Portland Cement Division plant of Ideal Cement Co. for 366 days supplied all the output. The same company operated a limestone quarry as a source of limestone for cement manufacture, which accounted for nearly all the stone produced in Morgan County during 1956. A small quantity of crushed sandstone mined by Morrison-Knudsen Co., Inc., and A. H. Horner Construction Co. for the Federal Bureau of Reclamation was also reported.

Clay mine production amounted to 26,500 tons of miscellaneous clay valued at $66,000. The Henefer open-pit mine was worked by the Interstate Brick Co. as a source of clay for its Salt Lake City brick plant.

The bulk of sand and gravel sold in 1956 was commercial paving gravel mined and prepared by W. W. Clyde Construction Co. and Morrison-Knudsen Co., Inc. However, some structural sand was produced by Wilkinson Construction Co. for the Federal Bureau of Reclamation.

**Piute.**—The Marysvale district was an important source of uranium ore in the State in 1956. During the first half of the year ore shipments were made from the Farmer John, Freedom, and Prospector properties of Vanadium Corp. of America, from the Buddy mine operated by Sunnyside Uranium Co., and from the Potts Fraction of the Black Bear Consolidated Mining Co. Ore was shipped to the Marysvale buying station, whence it was transferred to the mill at Salt Lake City.

Alunite continued to be the most important nonmetal produced by county mineral industries in 1956. The White Horse mine of Calunite Corp. was idle, but the company processed material mined in 1955 and shipped the crushed ore to various fertilizer-mixing plants. Western Gold & Uranium, Inc., mined 50 tons of alunite from the Applegarth deposit near Marysvale and used it in experiments.

The small output of metals (gold, silver, copper, lead, and zinc) in Piute County in 1956 was recovered from ore produced by Arundel Mining Co. from the Deer Trail mine and by Cedar Hills Mining Co. from the Shamrock mine and shipped directly to smelters without beneficiation.

**Rich.**—The operation of phosphate-rock properties by San Francisco Chemical Co. constituted the only significant mining activity in

Digitized by Google

Rich County during 1956. The ore was shipped to a company-owned processing plant at Leefe, Wyo.

Sand and gravel production consisted of 3,000 tons of paving gravel mined by construction crews of the Utah State Road Commission.

**Salt Lake.**—In 1956, as in numerous past years, Salt Lake County was one of the most important mineral mining, milling, smelting, and refining areas in the United States. The total value of mineral output in Salt Lake County in 1956 was $269.4 million—19 percent above 1955. Most of this increase in 1956 resulted from a $38.9 million advance in the value of output of copper in the county, compared with 1955. Other commodities with substantial gains in value of output included zinc ($1.5 million increase), molybdenum ($1.2 million increase), lead ($814,000 increase), and sand and gravel ($488,000 increase).

Most of the metal output was from the Utah Copper and U. S. and Lark mines. Other activity in metal mining included the Carr Fork Operation (The Anaconda Co.) exploration and development program and leaser production on the Apex-Delaware group, Highland Boy, Utah Apex, and Yampa claims, and production from the El Dorado mine by the El Dorado Mining Co. Other active metal mines in the county in 1956 comprised 2 (Cardiff and Silver King Western) in the Big Cottonwood district and 2 (Dwyer and Sunday claims) in the Little Cottonwood district. In the Smelter district the United States Smelting Refining and Mining Co. re-treated lead slag from the Midvale smelter.

The Utah Copper mine—the largest gold, silver, and copper producer in Utah and top ranking copper-producing mine in the United States—and the U. S. and Lark mine—the State's leading lead and zinc producer—are both in the West Mountain (Bingham) district near Salt Lake City, the leading base- and precious-metal-producing district in Utah in 1956.

Copper ore from the Utah Copper Division, Kennecott Copper Corp., open-pit mine was treated in two 40,000-ton-per-day flotation mills at Arthur and Magna. Both copper and molybdenum concentrates were recovered from the ore. The copper concentrate was shipped to the Garfield copper smelter and copper-anode plant of the American Smelting and Refining Co. Custom ore from Utah and out-of-State producers was also accepted at this smelter. The Kennecott Copper Corp. product from the smelter and plant was transferred to the Kennecott Copper Corp. copper refinery at Garfield, where the finished products were copper, gold, and silver bars.

The lead-zinc ore from U. S. and Lark mine of the United States Smelting Refining and Mining Co. was concentrated at the company 1,700-ton-per-day mill at Midvale. Custom lead-zinc ore from Utah and other States was also treated at this mill. The concentrate went to the company Midvale lead smelter. Granulated zinc-bearing slag from the smelter was shipped to the International Smelting and Refining Co. zinc-fuming plant at Tooele in Tooele County.

Other mineral-processing or refining plants in Salt Lake County included the Howe Sound Co. cobalt refinery, Garfield Chemical & Manufacturing Corp. sulfuric-acid plant, and Western Phosphates, Inc., triple superphosphate plant, all at Garfield.

Digitized by Google

One of the three uranium mills in Utah was at Salt Lake City; it was operated by Vitro Uranium Co., a division of Vitro Corp. of America. Ore for the 550-ton-per-day plant was supplied primarily from the San Rafael-Green River area and from the Marysvale district. In 1956 Vitro started a $1.2 million program to increase both efficiency and capacity.

In Salt Lake City, Salt Lake Tungsten Co. operated its plant on custom tungsten ore from Utah and other States, and Filtrol Corp. processed halloysite clay from Juab County, Utah.

Two of the State's largest petroleum refineries (operated by Salt Lake Refining Co. and Utah Refining Co.) were also in Salt Lake City.

Cement was produced by Portland Cement Co. of Utah at its plant in this area. Interstate Brick Co. and Utah Fire Clay Co. of Salt Lake City produced common brick.

Salt was produced by solar evaporation of brine at the Morton Salt Co. plant on the shores of the Great Salt Lake near Saltair. An expanded-perlite mill in Salt Lake City was operated for the first half of the year by Utco Products Co. and during the latter half of the year by Acme Lite Wate Products, Inc., on raw material from Beaver County, Utah. Vermiculite-Intermountain, Inc., operated its exfoliated-vermiculite plant in Salt Lake City throughout the year.

The Kennecott Copper Corp. stated in its annual report for 1956 that 32.3 million tons of ore was mined and milled from the Utah Copper mine at Bingham by the Utah Copper Division. This was 17 percent above the quantity of ore mined and milled in 1955. The ore averaged 16.6 pounds of copper per ton. Copper production from all sources (including copper precipitate from water) reported by the Utah Copper Division was 248,158 tons, compared with 230,837 tons in 1955. To get ore out of the pit without hauling it considerable distances upgrade, as the open pit was deepened, two tunnels connecting the lower levels of the pit with the main ore-haulage system had been provided. Work was begun in October on a third tunnel 350 feet below the one completed in 1951. The new tunnel will be 18,000 feet long, will cost approximately $12.9 million, and was planned for completion in 3 years. The vertical casting installation at the refinery, completed late in 1955 to provide the larger shapes now in demand by customers, was placed in operation.

According to the United States Smelting Refining and Mining Co. annual report for 1956, operations at the U. S. and Lark mine at Bingham continued on the alternate 5- and 6-day-week basis, with 2 shifts per operating day. The grade of ore produced was about the same, but tonnage was somewhat higher than in 1955. Sinking of the inclined shaft preparatory to opening 2 new and deeper operating levels in the Lark section was about 80 percent completed at the end of the year, and sinking of a winze to explore deeper levels in the U. S. section was started. Development in the lower Bingham area, extending into the new property acquired under lease last year, was continued, together with other development projects. The Midvale plant operated without interruption on an alternate 5- and 6-day basis. Smelting operations were on a 2-shift basis, with the flotation mill normally on 3 shifts.

The value of nonmetal output in Salt Lake County rose to $4.9 million in 1956, compared with $4.1 in 1955—2 percent of the total

Digitized by Google

value of all mineral production in the county. Increased demand for sand and gravel by the construction industry—particularly for industrial and residential building—was responsible for the 20-percent increase in nonmetal value over 1955. Coupled with gains in building construction, portland-cement shipments were 4 percent greater than in 1955, and stone output (chiefly for cement) was 15 percent greater. Gains in lime production also were reported by the Kennecott Copper Corp., which produced quicklime for use at its copper-ore-reduction facilities. In comparison, the output of salt declined slightly below the 1955 level. The mining of miscellaneous clay by Interstate Brick Co. was discontinued in 1956.

**San Juan.**—San Juan County was the prime source of uranium ore, producing three-quarters of the State total. Shipments of ore were reported from 164 properties during the first half of the year and totaled 316,000 tons at an average grade of 0.32 percent contained $U_3O_8$. The more productive properties were:

| Property: | *Operator* | *Locality* |
|---|---|---|
| Big Buck No. 9A | Standard Uranium Corp. | Lisbon Valley. |
| Bobcat | Little Beaver Mining Co. | Do. |
| Far West | Hidden Splendor Mining Co. | Do. |
| Fortunate | Hecla Mining Co. | Do. |
| Happy Jack | Bronson & Cooper Mining Co. and Last Chance Mining Co. | White Canyon. |
| Hideout | White Canyon Mining Co. | Deer Flat. |
| Jean No. 1 | Boyles Bros. Drilling Co. | Indian Creek. |
| Maybe No. 3 | Hall & Bailey, Inc. | Red Canyon. |
| Mi Vida | Utex Exploration Co. | Lisbon Valley. |
| North Point | White Canyon Mining Co. | Fry Canyon. |
| Richardson | La Sal Mining & Development Co. | Lisbon Valley. |
| Section 36 | Continental Uranium, Inc. | Do. |

These 12 properties yielded 78 percent of the county total for the half-year period.

The major producing property was the Mi Vida mine of Utex Exploration Co. During 1956 shipments of ore from the mine were limited by the AEC to 15,000 tons per month and production was geared approximately to this schedule. Average labor force at the mine was as follows: 30 miners, 7 mechanics, 6 surface men, and 4 waste-development contract employees for a total of 47. The mine operated on a 2-shift basis. In addition, there were a cook and helper for each shift. All employees at the mine (including salaried personnel) reportedly were averaging 14 tons per man-shift at the end of the year.

During 1956 a sublevel haulage system was completed and placed in operation. The new system consisted of 3,000 feet of tunnel and 7 vertical raises 50 feet in height, through which ore was dropped from the mining horizon.

Mining methods and costs at the Big Buck mine of Standard Uranium Corp. were described in a Bureau of Mines report released in December.[7] As of February 1956, after 1 full year of operation, the Big Buck mine had produced 96,500 tons of ore.

Homestake Mining Co., through its subsidiary companies (the Little Beaver Mining Co. and the La Sal Mining & Development Co.),

[7] Dare, W. L., and Durk, R. R., Mining Methods and Costs, Standard Uranium Corp., Big Buck Mine, San Juan County, Utah: Bureau of Mines Inf. Circ. 7766, 1956, 51 pp.

Digitized by Google

produced uranium ore at a rate of 300 tons per day from its 2 properties—Little Beaver (Bobcat) and La Sal (Richardson). According to the company annual report, production for the year was: Little Beaver—30,400 tons at 0.41 percent, La Sal—61,700 tons at 0.37 percent. The company began development of a third property, the North Alice group, in January with construction of surface facilities; in March a 3,000-foot inclined adit was begun and was near completion by year end.

At Mexican Hat, Texas-Zinc Minerals Co. (subsidiary of The Texas Co. and The New Jersey Zinc Co.) began constructing a 775-ton-per-day mill. Ore for the mill will originate in part from the company Happy Jack mine in White Canyon and from other mines in the surrounding area.

San Juan County occupied much of the attention of the Rocky Mountain oil industry in 1956 as a result of discovery of major oil-producing areas within the Paradox basin. Early in the year The Texas Co. completed the No. 1 Navajo (sec. 23, T. 40 S., R. 24 E.), the discovery well of the Aneth field. Initial daily flow from the well was 1,700 barrels of oil. The confirmation well was completed by Superior Oil Co. By the end of the year, 20 producing wells had been completed in the field, with daily initial flows ranging from 300 to 1,900 barrels and averaging 800 barrels. Operators responsible for the drilling were The Texas Co., Superior Oil Co., Three States Natural Gas Co., Shell Oil Co., and Gulf Oil Corp.

Discovery of the East Aneth field (sec. 20, T. 40 S., R. 26 E.) by The Texas Co. and of the North Desert Creek field (sec. 12, T. 41 S., R. 23 E., unsurveyed) by the Shell Oil Co. was reported in September. Each discovery well in both fields had a reported initial daily production of 1,400 barrels. In addition, 5 other successful wildcat oil wells were completed, as follows: Recapture Creek (sec. 21, T. 40 S., R. 23 E.) and Bluff (sec. 4, T. 40 S., R. 23 E.) by Shell Oil Co.; 2 unnamed fields (secs. 18 and 26, T. 40 S., R. 24 E.) by The Texas Co., 1 of which was later included in the Aneth field; and a discovery (sec. 16, T. 43 S., R. 22 E., unsurveyed) by the Western Natural Gas Co. A natural-gas discovery was reported by United States Smelting Refining and Mining Co. in sec. 9, T. 43 S., R. 21 E., unsurveyed.

The outstanding success of the 1956 drilling program in San Juan County was primarily responsible for more than a 100-million-barrel increase in State oil reserves. County production, although showing more than a threefold increase over the preceding year, fell far short of the area potential because of lack of outlets. Some crude oil (approximately 2,000 barrels per day) was moving by truck and rail from the Aneth field to Salt Lake City by year end; but, in general, wells were shut in, waiting outlets.

Proposals for pipelines to carry Paradox basin crude oil to Salt Lake City, Texas, and southern California were announced by the end of the year.

Sand and gravel production in 1956 was predominantly paving gravel quarried by D. W. Brimhall & H. J. Wimmer, contractors for the Federal Bureau of Public Roads.

A small quantity of agate was collected by D & E Products Co. from the Thomas Range.

Digitized by Google

Small quantities of copper and silver were recovered from ore from the Four Aces mine in the White Canyon district.

Some uranium ores of western San Juan County contain appreciable quantities of copper associated with the uranium mineralization; the copper by itself is not economic under present conditions. In the first 6 months of 1956, 37 San Juan properties shipped copper-bearing uranium ore to the AEC mill at Monticello; these shipments totaled 69,161 tons containing 960,580 pounds of copper (13.9 pounds per ton). The copper was paid for by the AEC and became the property of that agency. This copper was not credited to the county or State as production in 1956. Most of the ore came from the White Canyon, Red Canyon, Deer Flat, and Fry Canyon areas; some ore also originated in the Abajo Mountains, Elk Ridge area, and Reed Canyon.

**Sanpete.**—Rock salt continued to be the dominant mineral commodity in Sanpete County in 1956, and all mine production came from the Royal Crystal Salt Co. mine at Axtell operated by Albert Poulson. Output was used for cattle feed and shipped to feed dealers in Arizona, Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming.

Six thousand tons of structural and paving sand and structural and paving gravel was produced and sold by Cox Bros.

Three States Natural Gas Co. completed the Joe's Valley discovery oil well in early 1956. The well, producing from the Ferron sandstone, was in sec. 20, T. 15 S., R. 6 E. A confirmation was also successfully completed in both the Ferron and the Dakota sandstones. An 8-mile pipeline was installed to connect the field to the Clear Creek gas system.

**Sevier.**—The nonmetals group, consisting of gypsum, clays, sand and gravel, and salt, accounted for 76 percent of the $1.1 million value of all minerals produced in 1956. This compares with a 79-percent contribution by the nonmetals toward the $1.3 million total value of all minerals in 1955. The decline resulted from a 23-percent lower output of crude gypsum by the United States Gypsum Co. and Western Gypsum Co. The remaining nonmetals all increased in output and followed the general upward trend in the demand for construction materials.

Clays were mined by Western Clay & Metals Co., which produced bentonite and fuller's earth from its Redmond and Aurora pits.

Sand and gravel output reached 48,500 tons and consisted of 30,500 tons of commercial structural sand and gravel produced by Elmo R. Herring and Redmond Sand & Gravel Co. Government-and-contractor output was 18,000 tons of paving gravel mined by construction crews of the Utah State Road Commission.

Salt output reached 2,400 tons and was produced by Poulson Bros. Salt Co., which operated its rock-salt mine near Redmond. Rock salt was shipped to feed dealers in Arizona, Colorado, Idaho, Montana, Nevada, and Utah, and exported to Canada.

Coal production was derived from the Southern Utah Fuel Co. mine, which employed an average of 10 men.

In the first 6 months of the year, 1 test shipment of uranium ore was made from the Last Chance claim operated by the Last Chance Mining Co.

Digitized by Google

Gold, silver, lead, and zinc with a total value of $1,285 were recovered from ore mined by Scott M. Nebeker, Gloria Mining Co., and Wilford W. Sweeney from deposits in Sevier County.

**Summit.**—The total value of the mineral production in Summit County increased from $1.2 million in 1955 to $5.6 million in 1956. Most of this gain came from the advanced output of lead and zinc in the county, mainly from the United Park City Mines Co. mines. Production by this company in 1956 came from its Summit County mines, whereas in 1955 most of it came from Wasatch County mines. The value of gold, silver, copper, lead, and zinc output from deposits in Summit County made up 93 percent of the total value of all minerals produced in the county in 1956.

The United Park City Mines Co. group of mines was the second-ranking lead and zinc and third-ranking silver producer in the State in 1956. The company reported that it mined and shipped 83,427 tons of lead-zinc ore (with an average assay of 0.030 ounce of gold and 5.71 ounces of silver per ton, 0.125 percent copper, 7.10 percent lead, and 9.64 percent zinc) to the International Smelting and Refining Co. (IS&R) plant at Tooele and the United States Smelting Refining and Mining Co. (USSR&M) plant at Midvale for concentration, lead smelting, and fuming of the zinc-bearing slag produced. In addition, it shipped 10,376 tons of tailing material to American Smelting and Refining Co. (AS&R) copper smelter at Garfield and 1,260 tons of low-grade siliceous material to IS&R lead smelter and zinc-fuming plant at Tooele and AS&R smelter at Garfield. In 1956 the company also did extensive exploration and development at its mines, comprising 22,988 feet of tunnel, 11,344 feet of diamond drilling, and 42,514 feet of long-hole percussion drilling. An oil warehouse, railroad spur, and loading dock were built near Keetley during 1956.

Five other mines produced varying quantities of gold, silver, copper, lead, and zinc in Summit County in 1956. G. W. Wortley shipped material to the smelter from the Atkinson tailing dump, Wortley Bros. shipped from Clegg Lease tailing dump, Wortley Bros. and McFarland & Hullinger shipped from the Grasselli tailing dump, and McFarland & Hullinger shipped from the Ontario and Park Flag mine dumps.

Nonmetals played only a small role in the overall mining activity of the mineral industries in 1956. Sand and gravel and stone for highway use were the most important. The Federal Bureau of Public Roads, the Utah State Road Commission, and the county highway department were all actively engaged in highway construction. Whiting & Haymond, Vernal Sand & Gravel Co., and Wheelwright Construction Co. were the leading private contractors working for these agencies; crushed sandstone was the principal stone and was quarried by Utah Construction Co. for the Federal Bureau of Reclamation. Clay production consisted of 14,700 tons of miscellaneous clay mined by the Utah Fire Clay Co. from its Henefer pit.

Coal was produced from the Chappell mine operated by the Chappell Coal Co. The company employed 13 men during the year.

**Tooele.**—The total value of mineral output in Tooele County in 1956 ($4 million) was 9 percent above the comparable figure for 1955. Increased output was reported for 10 of the commodities produced in 1956, including gold, silver, copper, lead, zinc, lime, potash, pumice, and gem stones. Declines were reported for output of salt, stone, and

465877—58——74

Digitized by Google

tungsten, and no production was reported for clays and sand and gravel.

In 1956 Tooele County continued to be an important lead-zinc milling and smelting area. The International Smelting and Refining Co. 1,500-ton-per-day concentrator and lead smelter and zinc-slag fuming plant at Tooele were operated on ore, concentrate, and slag from Utah and other States throughout the year. In 1956 Combined Metals Reduction Co. continued to accept custom lead-zinc ore for treatment in its 700-ton-per-day mill at Bauer.

Output of gold, silver, copper, lead, and zinc came from 21 active mines in the county in 1956. Of these operations, the United States Smelting Refining and Mining Co. Ophir Unit mine, the Combined Metals Reduction Co. Calumet mine and Bluestone tailings-dump operations, and Zuma Uranium & Oil Corp. Zuma mine were the principal producers. Each of the 17 remaining active mines in the county in 1956 mined and shipped or treated less than 100 tons of ore.

The value of nonmetals produced in Tooele County dropped to $1.8 million, or only 45 percent of the total value of all mineral products, compared with a total value of nonmetals of $1.9 million or 52 percent of the total county value in 1955. This moderate decline was due largely to lack of any clay and sand and gravel production and a decline in salt output. Potash was again the most important commodity, and all output came from the Bonneville, Ltd., plant. Salt ranked second in terms of value, and the Grantsville area of the county was the scene of productive activity by the Deseret Salt Co. and Stansbury Salt Co., Inc. Except for a small quantity of ornamental stones, the construction materials—lime, stone, and pumice and pumicite—accounted for the remaining production.

At Bauer the coal-resin plant of Combined Metals Reduction Co. was rebuilt with modernization after its destruction by fire in September 1955. The new plant has the capacity to produce 10 tons per day of refined resins. The resins are used in chewing gum, paints and lacquers, and printing inks. The resins were received from the Hiawatha coal mine (Carbon County) where a flotation concentrate was produced as a byproduct of the coal-mining operation.

**Uintah.**—The American Gilsonite Co. completed its 800-foot, 4-compartment shaft on the Cowboy vein at Bonanza in the spring. At the same time, the company laid the foundations for a gasoline and metallurgical-coke refinery near Grand Junction, Colo.

The gilsonite operation has developed considerable interest in several unusual features associated with the mining, transportation, and refining of the solid hydrocarbon. Mining methods take cognizance of the explosive nature of gilsonite dust-laden air, and two methods have been developed for breaking the material from the face. A cutting machine of special design is used where vein material is hard and unfractured, and a water spray is directed through the cutting teeth to reduce dust. Where the vein material is fractured sufficiently, as in most portions of the Cowboy vein, a hydraulic jet directs high-pressure water into the fractures, resulting in disintegration of the face material. No wetting down is necessary for preventing dust in the hydraulic method.

With both cutting methods additional water is supplied to the face to wash the cut material down 2½° slopes to the shaft, where the coarse

Digitized by Google

material is dewatered and hoisted by clamshell bucket and the fine material (minus-¾-inch) is pumped to surface level.

A surface preparation plant cleans, sizes, and dries material for the conventional market. Additionally, other material will be cleaned and "re-slurried" for transmission to the refinery near Grand Junction (Colo.) through an 8-inch pipeline 71 miles long.

The initial capacity of the refining plant reportedly will be 500 tons per day of gilsonite, with an output of 250 tons of high-purity coke and 60,000 gallons of gasoline.

Sohio Petroleum Co. (a subsidiary of Standard Oil Co. of Ohio) undertook to examine asphaltic sand deposits of Asphalt Ridge near Vernal to determine their extent and the economic feasibility of separating and utilizing the contained bitumen.

Production of crude petroleum declined to 1.8 million barrels in 1956, with smaller output reported from major fields—Ashley Valley, Red Wash, and Roosevelt. The remaining two fields—Walker Hollow and Brennan Bottom—had greater production than in 1955.

An oil discovery was credited to Gulf Oil Corp. for finding production in the Wasatch formation of the Brennan Bottom field. A Havenstrite Oil Co. well (sec. 22, T. 9 S., R. 20 E.) resulted in the second Uintah County oil discovery for the year. The company also had a gas discovery (sec. 9, T. 10 S., R. 22 E.). Both of these latter wells were in the Ute Trail unit; oil production was from the Green River formation and gas from the Wasatch. A second gas discovery was made by El Paso Natural Gas Co. at Southman Canyon (sec. 11, T. 10 S., R. 23 E.), with commercial production from the Green River formation.

At Jensen a 1,200-barrel-per-day refinery was operated by the Uinta Oil Refining Co.

In the first 6 months of the year a shipment of uranium ore was made from the Bobo claim by the Texas Plungers & Associates.

Except for 3,000 tons of commercial sand and gravel mined by W. W. Clyde Construction Co., all sand and gravel produced in 1956 came from pits operated by private contractors working on highway contracts.

**Utah.**—Of the nonmetals that composed 89 percent of the total value of mineral production in Utah County during 1956, limestone quarried by the United States Steel Corp., Lakeside Lime & Stone Co., and Utah Lime & Stone Co. was the principal commodity. The major uses, in order of importance, were: Flux, lime manufacturing, concrete aggregate, roadstone, refractories, riprap, rock dust for coal mines, and other miscellaneous applications. The bulk of the sand and gravel produced in 1956 was commercial material, and the more important producers were Thorn Rock Products Co., Lee Sand & Gravel Co., and Warburton & Sons. The Lakeside Lime & Stone Co. was the only lime producer and sales of quick and hydrated lime more than doubled in 1956. Shipments were restricted to the Salt Lake City region for use in steel open-hearth furnaces for the concentration of base-metal ores, petroleum refining, and lump lime for flux.

Nine open-pit clay mines were operated by 6 individuals or firms in 1956, and output reached 157,000 tons of fire and miscellaneous clay. Utah Fire Clay Co. operated its Clinton fire-clay mine, and fire clay was also removed from the Wadley mine of R. D. Wadley Clay Co. and the Lake Mountain pit of Western Fire Clay Co. Miscellaneous

Digitized by Google

clay was mined from pits operated by Florence Powell, Loyd Stubbs, Utah Fire Clay Co., and Interstate Brick Co.

Pumice was recovered from a pit near Cedar Valley worked by William H. Prince & Sons Block Co. and used at its Salt Lake City block plant.

The value of the metal output (gold, silver, copper, lead, and zinc) in the county in 1956 ($280,000) was 11 percent above that in 1955. Of the nine active metal mines, the Tintic Standard and Iron Blossom mines (owned by Tintic Standard Mining Co. and operated by leasers) were the most productive. The Tintic Standard was operated from January 1 to June 30, and a total of 6,420 tons of ore (containing 240 ounces of gold, 105,526 ounces of silver, 42,943 pounds of copper, and 585,475 pounds of lead) was mined and shipped to smelters. The Iron Blossom was operated from August 1 throughout the remainder of the year. A total of 1,717 tons of ore containing 66 ounces of gold, 12,576 ounces of silver, 4,602 pounds of copper, and 66,871 pounds of lead was mined and shipped to the American Smelting and Refining Co. smelter at Garfield. In addition, 6 tons of ore containing 216 ounces of silver and 3,943 pounds of lead was mined and shipped to the International Smelting and Refining Co. smelter at Tooele. The hoist and hoist house were destroyed by fire and replaced in 1956. The Colorado Consolidated, Mountain View, and Yankee Consolidated mines were the remaining major metal producers in the county in 1956.

**Wasatch.**—The value of mineral production in Wasatch County dropped from $7.7 million in 1955 to $3.0 million in 1956 because of a drop in the value of lead and zinc output. The combined value of these two metals produced in the county in 1956 was $1.9 million, compared with $5.8 million in 1955. Most of this decline resulted from inactivity of the United Park City Mines Co. mines on the Wasatch side of the Wasatch-Summit County boundary line (activity was limited to the Summit County mines), coupled with reduced output from New Park Mining Co. mines in Wasatch County.

The Mayflower-Park Galena mines operation (New Park Mining Co.) was the third-ranking lead, zinc, and gold producer in 1956. The company reported that during 1956 development of the 1,880 and 2,005 levels was begun from the Mayflower shaft, which was sunk an additional 69 feet in 1956. A new pumping station completed on the 1,630 level had a capacity of 3,000 gallons of water per minute. The water flow was 1,100 gallons per minute at the close of the year. A new underground mechanical shop provided immediate service for repairs on mining machinery underground and increased efficiency by eliminating the need for transportation to the surface.

McFarland & Hullinger shipped Park City Consolidated Co. dump material to the American Smelting and Refining Co. smelter at Garfield for use as a flux.

**Washington.**—The value of gold, silver, copper, and lead output in Washington County made up $106,000 of the $134,000 total value of mineral production in the county in 1956. These metals were recovered from ore from four active mines and copper-slag material from the Apex smelter dump. The Apex-Dixie Mines, Inc., Apex mine in the Tutsagubet district was the major metal-producing mine followed by the Western Gold & Uranium, Inc., Silver Reef mine in the Harrisburg (Leeds) district.

Digitized by Google

Shipments of uranium ore were made during the first half of the year from the Chloride Chief mine of Western Gold & Uranium, Inc.

All sand and gravel produced in 1956 resulted from the activities of construction and maintenance crews of the State and county highway departments.

**Wayne.**—Seventeen uranium properties were active in the first 6 months of 1956. Total ore shipments for the period amounted to 887 tons. Major producing properties were the Desert Group operated by N. B. Hunt and the Big Jim No. 11 operated by the Capitol Reef Uranium Corp. and Acme Uranium Mines, Inc.

The Utah State Road Commission had construction crews working in Wayne County during 1956; in the course of highway construction 6,000 tons of paving gravel was produced.

Petrified wood and bone, agate, and obsidian were collected by A. L. Inglesby during the year.

**Weber.**—Nonmetals were the only mineral products of Weber County in 1956; the value of these commodities rose to $304,700 compared with $263,400 in 1956. Crushed limestone quarried by a number of private contractors working for the Federal Bureau of Reclamation was the only stone produced; 231,500 tons of sand and gravel was classified as commercial material used by local building contractors. Government-and-contractor output consisted of 115,500 tons of paving sand and gravel. The need for clay by the Harrisville Brick Co. for brick and other clay products resulted in the production of 22,800 tons of miscellaneous clay.

Digitized by Google

Digitized by Google

# The Mineral Industry of Vermont

By Robert W. Metcalf [1]

MINERAL OUTPUT in Vermont in 1956 was valued at $23.1 million—3 percent less than in the peak year 1955 but 13 percent higher than in the preceding peak, 1954. Nonmetals again supplied over 85 percent of the total value, with copper furnishing most of the balance. Eleven minerals were produced in 1956, compared with 12 in 1955. Each of the 14 counties in the State reported output.

Stone (which included marble, granite, limestone, and a small quantity of miscellaneous stone) had the highest value of production in Vermont in 1956. Slate, asbestos, copper, and sand and gravel were next in order of value of output. In 1956 the leading counties, in order of value of mineral production, were Rutland, Washington, Orange, Lamoille, Franklin, and Chittenden.

**TABLE 1.—Mineral production in Vermont, 1955–56 [1]**

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 14,200 | $14,200 | (2) | (2) |
| Copper (recoverable content of ores, etc.) | 4,305 | 3,211,530 | 3,403 | $2,892,550 |
| Gem stones | (3) | 8 | | |
| Gold (recoverable content of ores, etc.)—troy ounces | 181 | 6,335 | (2) | (2) |
| Pyrites—long tons | [4] 21,685 | (2) | 22,537 | 107,117 |
| Sand and gravel | 1,763,229 | 1,169,031 | 1,909,778 | 905,397 |
| Silver (recoverable content of ores, etc.)—troy ounces | 50,447 | 45,657 | (2) | (2) |
| Slate | (2) | (2) | 162,239 | 3,721,545 |
| Stone | 581,749 | 11,061,196 | 620,510 | 11,622,274 |
| Value of items that cannot be disclosed: Asbestos, lime, talc, and values indicated by footnote 2 | | 8,399,641 | | 3,914,647 |
| Total Vermont [5] | | 23,884,000 | | 23,131,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Weight not recorded.
[4] Revised figure.
[5] Total adjusted to eliminate duplicating value of stone.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Copper.**—Production of copper in 1956 decreased 21 percent in tonnage compared with 1955 but only 10 percent in value, because of the higher price of copper during most of the year. Both underground

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

and surface mining was conducted by Appalachian Sulphides, Inc., (South Strafford), at the Elizabeth mine in Orange County.

**Gold and Silver.**—The smelting of Vermont copper ores yielded small quantities of gold and silver as byproducts. The recovery of both gold and silver in 1956 was smaller than in 1955 because of the decreased copper output.

**TABLE 2.—Mine production of recoverable copper, gold, and silver, 1947–51 (average) and 1952–56, in terms of recoverable metals**

| Year | Copper | | Gold | | Silver | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 2,944 | $1,272,639 | 125 | $4,382 | 28,666 | $25,944 |
| 1952 | 3,774 | 1,826,616 | 162 | 5,670 | 45,361 | 41,054 |
| 1953 | 3,947 | 2,265,578 | 171 | 5,985 | 43,128 | 39,033 |
| 1954 | 4,352 | 2,567,680 | 185 | 6,475 | 48,572 | 43,960 |
| 1955 | 4,305 | 3,211,530 | 181 | 6,335 | 50,447 | 45,657 |
| 1956 | 3,403 | 2,892,550 | (1) | (1) | (1) | (1) |

[1] Figure withheld to avoid disclosing individual company confidential data.

## NONMETALS

**Asbestos.**—Production of chrysotile asbestos in 1956 was slightly under 1955. The output was by Vermont Asbestos Mines of the Ruberoid Co. from a quarry at Lowell (Lamoille County), a few miles north of Hyde Park. Twenty or more grades of asbestos, varying in fiber length and quality, were prepared at the nearby mill. Prices were increased 5 percent as of January 2, 1956, and ranged from about $35 to $502 per short ton, according to grade and quality. The average value per ton rose from $88.70 in 1955 to $91.26 in 1956.

**Clays.**—Miscellaneous clay was mined in 1956 in Bennington, Chittenden, and Rutland Counties for use in making common brick and for mortar.

**Lime.**—Hydrated lime was produced by the Vermont Associated Lime Industries, Inc., in Addison County. Quicklime also was made in Chittenden County by the same firm.

**Pyrites.**—Appalachian Sulphides, Inc., produced pyrrhotite concentrate from copper ore mined at the Elizabeth mine in Orange County. Output in 1956 increased 4 percent in quantity compared with 1955.

**Sand and Gravel.**—Output of sand and gravel in 1956 increased 8 percent in tonnage compared with 1955, although the total value was less. Twenty-five commercial and 3 Government-and-contractor operators were active during the year. Production came from all but 1 of the 14 counties in the State, with commercial producers mining sand and gravel in 9 counties. Counties with the largest production (commercial and Government-and-contractor combined), in order of size of output, were: Windsor, Washington, Chittenden, Caledonia, Orange, and Rutland. Street and highway construction totaled 90 percent of the Government-and-contractor tonnage and 75 percent of the total Vermont tonnage (commercial and Government-and-contractor combined). The quantity of sand and gravel used by

Digitized by Google

Government agencies was 140,000 tons (13 percent) higher in 1956 than in 1955, mostly because of a large quantity of structural sand and gravel utilized in 1956 contrasted with none reported for structural purposes in 1955.

**Slate.**—Slate production in 1956 decreased in both quantity and value compared with 1955. The output of slate granules dropped sharply but still represented by far the largest tonnage of any use, followed by flagging and roofing. Both natural and artificially colored granules were prepared. There were 16 producers in 1956 operating 17 quarries, in contrast to 13 operators and 13 quarries in 1955. All output was from Rutland County.

**Stone.**—Stone production was again the largest mineral industry in Vermont, comprising slightly over half of the total value of all mineral industries in the State. The output in 1956 was 7 percent higher than in 1955 and the value 5 percent greater. Ten commercial producers quarried granite, limestone, marble, and miscellaneous stone. There were 16 quarries in operation: 6 granite quarries in Orange and Washington Counties; 5 limestone quarries in Addison, Chittenden, Franklin, and Rutland Counties (whiting in Rutland County); 4 marble quarries in Grand Isle, Rutland, and Windsor Counties; and 1 miscellaneous stone quarry in Bennington County. No municipal, county, or other Government-and-contractor operations were reported in 1956.

**Talc.**—Talc was mined in Vermont in 1956 by Eastern Magnesia Talc Co., Inc. (Burlington), operating in Lamoille and Washington Counties; and Vermont Talc Co. (Chester), with a mine in Windham County. Both firms operated crushing and grinding plants near the mines. The raw-material stocks at the Reading plant of the Vermont Mineral Products, Inc., which was destroyed by fire in 1955, were purchased in May 1956 by Eastern Magnesia Talc Co., Inc. Although the mine was not in operation in 1956, some sales of crude talc from stocks were made for use in roofing products. The total output of talc in Vermont in 1956 declined 14 percent and the value of production 4 percent, compared with 1955. No soapstone or pyrophyllite was mined in Vermont.

## REVIEW BY COUNTIES

**Addison.**—Vermont Associated Lime Industries, Inc., produced hydrated lime, mostly for building and for insecticides and fungicides. Sand and gravel was mined under contract for the State highway department for use in road construction. The United States Forest Service also produced some paving gravel for building roads in the Green Mountain National Forest. The Vermont Associated Lime Industries, Inc., also sold limestone for agricultural and other uses.

**Bennington.**—The Bennington Brick Co. resumed operations in 1956 after suffering severe flood damage the preceding year and produced a small tonnage of miscellaneous clay for brick. The Vermont Highway Department dug paving gravel, both with its own crews and under contract for road construction. The United States Forest Service also produced gravel in Bennington County for building forest roads. William E. Dailey, Jr., produced building and paving sand and paving gravel at a fixed plant at South Shaftsbury near North

Digitized by Google

Bennington. E. H. Fisher & Son (Manchester), mined a small tonnage of paving gravel. Miscellaneous stone also was produced by William E. Dailey, Jr. The stone was crushed and sold as roadstone, railroad ballast, and roofing granules.

**TABLE 3.—Value of mineral production in Vermont, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Addison | $131,218 | $138,048 | Lime, stone, sand and gravel. |
| Bennington | 69,349 | 73,195 | Sand and gravel, stone, clays. |
| Caledonia | (1) | 138,871 | Sand and gravel. |
| Chittenden | 329,644 | 353,316 | Sand and gravel, lime, stone, clays. |
| Essex | (1) | 12,850 | Sand and gravel. |
| Franklin | (1) | (1) | Stone, sand and gravel. |
| Grand Isle | (1) | (1) | Stone. |
| Lamoille | (1) | (1) | Asbestos, talc, sand and gravel. |
| Orange | (1) | (1) | Copper, stone, pyrites, sand and gravel, silver, gold. |
| Orleans | (1) | 12,550 | Sand and gravel. |
| Rutland | 9,520,069 | 9,693,744 | Stone, slate, sand and gravel, clays. |
| Washington | (1) | (1) | Stone, sand and gravel, talc. |
| Windham | (1) | (1) | Sand and gravel, talc. |
| Windsor | 142,413 | 139,902 | Sand and gravel, stone. |
| Undistributed [2] | 13,691,105 | 12,568,054 | |
| Total | 23,884,000 | 23,131,000 | |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes value for counties indicated by footnote 1 and in 1955 value of gem stones for which no county of origin was reported.

**Caledonia.**—Caledonia Sand and Gravel Co., Inc., produced washed sand and gravel from a portable plant near Waterford for building and road construction. Paving gravel was produced under contract for the Vermont Highway Department.

**Chittenden.**—Miscellaneous clay was mined by Drury Brick Co., Inc., at an open pit near Essex Junction; it was used in brickmaking. The W. C. Kirby Estate mined structural sand and gravel—part of which was sold as bank-run—from a pit near Burlington. George C. Stanley & Sons, Inc. (Burlington), produced run-of-bank sand for building and road use, and Vermont Paving Co. dug paving and road sands at Richmond. Engine sand was mined by the Rutland Railway Corp. from a pit at Colchester. The State highway department produced paving gravel under contract in Chittenden County. Vermont Associated Lime Industries, Inc., produced limestone for agricultural and other purposes, including the manufacture of lime.

**Essex.**—Road gravel was mined under contract for the State highway department.

**Franklin.**—Paving gravel for local use was produced under contract for the State highway department. The Swanton Lime Works, Inc., produced crushed limestone in Swanton for agricultural purposes, concrete aggregate and roadstone, flux, and other uses.

**Grand Isle.**—The Vermont Marble Co. quarried rough dimension marble at its Isle La Motte quarry.

**Lamoille.**—The Ruberoid Co. operated its Vermont Asbestos Mines quarry and mill at Lowell about 14 miles north of Hyde Park. Its product—chrysotile asbestos—was marketed in a number of grades for a variety of uses. The Eastern Magnesia Talc Co., Inc., mined talc from the No. 4 mine. Some of this material was sold crude, but

Digitized by Google

most of the product was ground in the company mill at Johnson. The ground talc was used for insecticides, asphalt, paint, paper, foundry facing, rubber, roofing, and other purposes. Sales also were made to dealers. Building and paving gravels were produced at a fixed plant by V. C. Farr of Morrisville. Paving sand and gravel was sold by Albert Nadeau of Johnson. Paving gravel for its own use was produced for the State highway department in Lamoille County.

**Orange.**—Copper was the mineral product of highest value in Orange County in 1956, followed in order by stone (granite), pyrites, sand and gravel, silver and gold. Appalachian Sulphides, Inc., produced copper from the Elizabeth mine south of South Strafford. Byproducts of milling were gold, silver, and a pyrite (pyrrhotite) concentrate. Both open-pit and underground mining was used. Benching in the opencut yielded about 17 percent of the total output. Both shrinkage and open-stoping methods were employed underground. Work underground included 3,593 feet of drifts, 11,449 feet of diamond drilling, and 1,290 feet of raising. A New Hampshire paper company purchased the pyrrhotite concentrate. The copper concentrate was shipped to the Laurel Hill (Long Island, N. Y.) refinery of the Phelps Dodge Refining Corp.; Brandeis Goldschmidt & Co., New York, N. Y.; and the General Services Administration for stockpiling.

The Rock of Ages Corp. produced light- and dark-gray granite block for monuments from the Pirie quarry at Williamstown. Paving sand was recovered from a pit at Williamstown by Levi Lemieux, and building and paving gravels were mined by the State highway department for local use in building roads.

**Orleans.**—Road gravel was mined in Orleans County under contract for the State highway department.

**Rutland.**—Rutland County in 1956 again ranked first in value of mineral output of Vermont counties. Mineral commodities produced, in order of value, were stone (crushed and dimension marble and crushed limestone), slate, sand and gravel, and clay.

Refractory mortar prepared from clay mined near Rutland was sold by Rutland Fire Clay, Inc.

Slate was quarried only in Rutland County in 1956. Seventeen quarries were operated by 16 producers. The principal producing firms or individuals were: Central Commercial Co., Castleton (roofing granules); Vermont Structural Slate Co., Fairhaven and Poultney (structural and sanitary, flagging, roofing, electrical, and miscellaneous); Covino Bros. Slate Co., Wells (roofing); Rising & Nelson Co., Inc., West Pawlet (roofing and flagging); Pedro Bros. Slate Co., Poultney (roofing and flagging); and Green Mountain Slate Co., South Poultney (roofing and flagging). The above 6 companies produced 96 percent of the tonnage of slate in Vermont in 1956 and 94 percent of the total value. Other leading producers were: Taran Bros., North Poultney; Calvert Slate Co., Inc., Poultney; Prehoda Slate Co., Inc., Wells; and Somich Bros., Pawlet—all of these firms produced slate for flagging and roofing.

Structural and paving sand and gravel were produced by R. D. Barker from his West Street pit in Rutland. This plant was sold to J. P. Carrara in December. The Vermont Marble Co. operated its Brandon pit during the year. Clark & Haynes produced structural

Digitized by Google

and paving sand and gravel near Poultney. Robert R. Greer (Poultney) mined sand and gravel for building and highway use and for sanding icy roads. Sand and gravel was mined under contract for the Vermont Highway Department for building local roads. The United States Forest Service mined gravel also for use in building roads.

Vermarco Lime Co. (West Rutland) and White Pigments Corp. (Florence) produced crushed and ground limestone. The Vermarco Lime Co. prepared limestone for blast-furnace flux, railroad ballast, agricultural purposes, use in paper and sugar mills, as a filler in various products, and for many other uses. White Pigment Corp. produced limestone for fillers for paints, pigments, and other materials; and products for abrasive use, leather finishing, and chemical purposes. Green Mountain Marble Corp. produced rough marble block at two quarries in Rutland County—the Clarendon and the Mine. The product of these quarries was transferred to the West Rutland mill for finishing. This mill produced rough block and sawed stone for exterior use, and cut or dressed marble for both exterior and interior use and for monuments. The Vermont Marble Co. produced rough marble block at its quarry at West Rutland. The finishing mill near the mine marketed sawed monumental and building stone, finished monumental stone, exterior and interior building stone and marble tile, and other specialties.

**Washington.**—Talc was mined from the No. 2 mine near Waterbury by Eastern Magnesia Talc Co., Inc. This product was ground in a nearby mill operated by the same company and sold for many different uses, including fillers for various industrial purposes. A special application for which the talc was sawed, not ground, was in making marking crayons.

Paul Dutton (Northfield) produced building gravel. Clarence J. Lepage (Barre) mined structural and paving gravel and small quantities of molding and building sand. Wilfred D. Lovie (Barre) produced structural and paving sand at a portable plant in Barre. Paving gravel for making town and county roads was produced by Alfred W. Adams from a plant near Montpelier. Richard C. Fiddock sold paving and road gravel from a pit at Berlin. Building and paving gravel was sold by J. F. Lamson and Kings Gravel Pit (both of South Barre). The City of Montpelier produced paving sand and gravel with its own crews for local street construction. The State highway department mined building sand and gravel. Gravel for road construction also was produced under contract for that agency.

The Rock of Ages Corp. produced rough and dressed monumental granite from three quarries in Washington County—the Rock of Ages and the E. L. Smith quarries, both near Graniteville; and the Wetmore-and-Morse quarry, near Websterville. A quantity of curbing stone for use on State highways also was sold. Both light and dark granites were marketed. Among the projects for which Rock of Ages granite was utilized were the following: War memorials in Tacoma, Wash., and Greenwich, Conn.; the Jesse Jones Memorial, Houston, Tex.; and a monument to Warren R. Austin, Sr., at Burlington, Vt. Rough monumental granite was quarried by Wells-Lamson Quarry Co., Inc., Websterville; and by Charles A. Pillette from the Adamant

Digitized by Google

quarry. Crushed granite for concrete and roadstone also was sold by Wells-Lamson Quarry Co., Inc.

**Windham.**—Vermont Talc Co. produced talc near Windham. The talc was ground in the company mill near Chester, Windsor County. Ground talc was sold for use in insecticides, paint, paper, rubber, and other products. Brattleboro Sand & Gravel Co. (Brattleboro) mined sand and gravel in 1956. Woodsboro Sand & Gravel Co. produced paving gravel near Jamaica, and Grafton L. Wilson, Jr., sold paving sand and gravel from a portable plant near Grafton. Sand and gravel for road construction was produced under contract for the Vermont Highway Department.

**Windsor.**—Vermont Mineral Products, Inc., sold the stocks of talc at its Reading mine to Eastern Magnesia Talc Co., Inc., in May 1956. The mine was idle during the year, but Eastern Magnesia Talc Co., Inc., sold appreciable quantities of talc from the Reading mine stockpile. The Vermont Talc Co. operated its grinding mill near Chester. Colonial Sand & Gravel, Inc., sold both bank-run and prepared sand and gravel for use in road construction. The preparation plant was at Sharon near White River Junction. The State highway department produced building sand and gravel. Sizable tonnages of paving gravel were mined under contract for that agency. The Vermont Marble Co. quarried rough block from which sawed and dressed stone were prepared. Some rough block was sold for exterior building purposes.

Digitized by Google

Digitized by Google

# The Mineral Industry of Virginia

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Virginia Division of Mineral Resources.

By Robert W. Metcalf[1]

VIRGINIA mineral production in 1956 broke all records in value and totaled nearly $209 million, more than one-fifth greater than the previous peak in 1955. Federal, State, and local road-building programs increased business and industrial construction, and the rising foreign demand for coal stimulated mineral output. This combination resulted in record production for stone and sand and gravel (the chief road building and construction materials produced in the State), and for the principal fuel mined—coal.

The value of production of clays, portland cement, coal, feldspar, kyanite, lead, lime, natural gas, sand and gravel, slate, stone, ilmenite, and zinc rose substantially compared with 1955. Of the 26 minerals produced in the State, only aplite, manganese ore, calcareous marl, mica, and soapstone declined appreciably. In order of value of products, the 10 chief mineral commodities produced in the Commonwealth were coal, stone, portland cement, sand and gravel, lime, zinc, salt, manganese ore, masonry cement, and gypsum. Coal supplied almost two-thirds of the total value of mineral output. The quantity of coal produced was double that of stone, which ranked second.

The value of fuels produced in Virginia increased to 67 percent of the total value of mineral output, compared with 63 percent in 1955. The value of all nonmetallics represented 29 percent compared with 32 percent in 1955, and the value of metals declined to about 4 percent of the total.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

TABLE 1.—Mineral production in Virginia, 1955–56 [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Beryllium concentrate.....pounds | 1,259 | $399 | 1,349 | $454 |
| Clays | 935,941 | 873,348 | 1,000,019 | 1,032,665 |
| Coal | 23,507,509 | 108,173,907 | 28,062,775 | 138,126,577 |
| Gem stones | 255 | 344 | | |
| Lead (recoverable content of ores, etc.) | 2,997 | 893,106 | 3,036 | 962,990 |
| Lime | 494,293 | 5,043,697 | 512,346 | 5,225,915 |
| Manganese ore (35 percent or more Mn)...gross weight | 32,654 | 2,779,337 | 20,231 | 1,901,963 |
| Marl, calcareous | (2) | (2) | 10,522 | 12,220 |
| Mica, sheet.....pounds | (2) | (2) | 396 | 5,814 |
| Natural gas.....million cubic feet | 968 | 259,000 | 2,926 | 810,502 |
| Petroleum (crude).....thousand 42-gallon barrels | 4 | (2) | (2) | (2) |
| Sand and gravel | 6,460,886 | 8,076,104 | 7,783,103 | 9,240,407 |
| Silver (recoverable content of ores, etc.)...troy ounces | 1,850 | 1,674 | 1,874 | 1,696 |
| Slate | 31,536 | 820,124 | 31,804 | 1,034,858 |
| Stone | 11,965,890 | 19,869,675 | 14,081,904 | 23,075,895 |
| Zinc (recoverable content of ores, etc.) | 18,329 | 4,508,934 | 19,196 | 5,180,616 |
| Value of items that cannot be disclosed: Aplite, cement (portland, masonry, and hydraulic lime), feldspar, gypsum, iron oxide pigments, kyanite, manganiferous ore (10 to 35 percent Mn), scrap mica (1955), pyrites, salt, soapstone, titanium concentrate, and values indicated by footnote 2 | | 24,045,936 | | 24,931,107 |
| Total Virginia [3] | | 172,541,000 | | 208,806,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] The total has been adjusted to eliminate duplicating the value of clays and stone.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Coal.**—Stimulated by the strong export demand and an active domestic market, coal production in Virginia again broke all records, rising to 28 million short tons valued at $138 million—a 19-percent increase in tonnage and a 28-percent rise in value. Higher costs and increased average values per ton contributed to the greater proportional rise in total value. Virginia ranked sixth as a coal-producer, its output represented nearly two-thirds of the value of all mineral production in the State.

Good-quality low- and high-volatile coals were mined and used for domestic and industrial purposes, including metallurgical, steam, and coking use. Semianthracite also was mined, principally for domestic consumption, in Montgomery County.

Bituminous coal was produced in 8 counties; by far the greater part came from counties in the extreme southwestern section of the State. Combined output in the 4 leading counties—Buchanan, Wise, Dickenson, and Tazewell—aggregated 92 percent of both total tonnage and value in the State. Most of the coal was mined underground, although a sizable tonnage was stripped, especially in Wise and Dickenson Counties. Over 600,000 tons (chiefly in Wise and Buchanan Counties) was mined with augers.

Digitized by Google

TABLE 2.—Production and value of bituminous coal, 1955–56, in short tons, by counties

| County | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Average value per ton [1] | Short tons | Value | Average value per ton [1] |
| Buchanan | 8,913,067 | $40,356,855 | $4.53 | 9,430,237 | $45,599,393 | $4.84 |
| Dickenson | 3,890,719 | 17,927,551 | 4.61 | 4,792,884 | 25,460,407 | 5.31 |
| Lee | 660,395 | 3,789,514 | 5.74 | 761,584 | 4,636,273 | 6.09 |
| Montgomery | (2) | (2) | (2) | 7,340 | 44,627 | 6.08 |
| Russell | 1,013,633 | 4,708,989 | 4.65 | 1,471,111 | 6,661,502 | 4.53 |
| Scott | (2) | (2) | (2) | 7,300 | 34,310 | 4.70 |
| Tazewell | 2,970,212 | 15,695,409 | 5.28 | 3,542,464 | 21,464,700 | 6.06 |
| Wise | 6,026,003 | 25,515,144 | 4.23 | 8,049,855 | 34,225,365 | 4.94 |
| Other counties | 33,480 | 180,445 | 5.39 | | | |
| Total Virginia | 23,507,509 | 108,173,907 | 4.60 | 28,062,775 | 138,126,577 | 4.92 |

[1] Value received or charged for coal f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel, and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Other counties."

**Petroleum and Natural Gas.**—Petroleum and natural gas were important local sources of fuel.

Output of petroleum was entirely from the Rose Hill field in Lee County. No new wells were drilled in this field during 1956, but a new company purchased 11 wells—8 will be plugged and 3 saved as producers.

The output of natural gas in Virginia in 1956 tripled in both quantity and value and was recovered largely from Dickenson and Buchanan Counties; much smaller quantities came from the Early Grove field in Scott County and from Russell and Wise Counties. The increased production was due to completion of a 12-inch pipeline and four smaller lines connecting the Clinchfield Coal Co. wells in Dickenson County with the distribution lines of the Kentucky-West Virginia Gas Co. In Buchanan County, the United Producing Co. delivered sizable quantities of natural gas to the Hope Natural Gas Co.[2] The producing gas wells range from 2,500 to 5,900 feet in depth. As a result of test drilling in Buchanan, Dickenson, Russell, and Wise Counties in the Appalachian Plateau region, two new fields were discovered in south central Dickenson County, and wells were being connected into the pipeline distribution system.[3]

## NONMETALS

**Aplite.**—The competition of imported glass, especially windowglass, reduced the demand for aplite from American glassmakers. As a result, the production of aplite decreased, compared with 1955. Two producers in Amherst and Nelson Counties near Piney River shipped aplite to glass manufacturers as a source of alumina. Virginia was the only source of aplite in the United States.

[2] Young, David M., Oil and Gas Development in Virginia During 1956: Virginia State Dept. of Labor and Industry, Ann. Rept., 1956, Richmond, Va., 1957, pp. 87-88.
[3] Richards, Horace G., Developments in Atlantic Coastal States Between New Jersey and South Carolina in 1956: Bull. Am. Assoc. Petrol. Geolog., vol. 41, No. 6, June 1957, p. 1221.

465877—58——75

Digitized by Google

**Cement.**—Portland-cement shipments in Virginia almost matched shipments in the active year 1955 but surpassed the 1955 value by 6 percent. Shipments of masonry cement and hydraulic lime decreased 7 and 8 percent, respectively, compared with 1955. Hydraulic lime was produced from local shale in Warren County at Riverton. Portland and masonry cements were manufactured by 2 companies, 1 operating a dry-process plant at Fordwick, Augusta County and the other both a dry-process plant at Cloverdale (Botetourt County, and a wet-process plant at South Norfolk (included for statistical purposes under Norfolk County). Production of the South Norfolk plant was slowed by a towboat-crew strike, resulting in a loss of 71 kiln days. This was partly offset by adding a new kiln, which began burning cement in mid-September at the Cloverdale works. Chief raw materials used at the South Norfolk plant were marl and clay from nearby company mines. The cement company mined limestone near the Cloverdale plant and also produced shale and limestone, which were used at the Fordwick plant.

**Clays.**—Production of clays in Virginia in 1956 topped 1 million short tons valued at over $1 million and was 7 percent higher in tonnage and 18 percent higher in value than in 1955. The entire output, consisting of miscellaneous or common clay or shale, was consumed in heavy clay products, lightweight aggregate, and cement. Clays were produced by 13 companies at 15 plants in 13 counties. The leading clay-mining companies in 1956 were: Roanoke-Webster Brick Co., Inc., Roanoke (Botetourt County) and Suffolk (Nansemond County); Virginia Lightweight Aggregate Corp., Webster (Botetourt County); Southside Brick Works, Inc., Richmond (Chesterfield County); and Shenandoah Brick & Tile Corp., Winchester (Frederick County). The more important clay-producing counties, in order of output, were: Botetourt, Henrico, Chesterfield, and Frederick.

**TABLE 3.—Clays sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 591, 801 | $554, 496 | 1954 | 704, 843 | $723, 292 |
| 1952 | 940, 496 | 996, 351 | 1955 | 935, 941 | 873, 548 |
| 1953 | 952, 266 | 927, 571 | 1956 | 1, 000, 019 | 1, 032, 666 |

**Feldspar.**—Output of feldspar in 1956 in Virginia increased 7 percent over 1955. All production in Bedford County came from 1 producer at 4 mines near Bedford. Both potash and soda feldspar were produced. The feldspar was ground in the company mill for use in pottery and enamel. Some North Carolina feldspar also was processed.

**Gypsum.**—The United States Gypsum Co. mined crude gypsum at Plasterco (Washington County). Production in 1956 was slightly under 1955. At Plasterco this firm also operated a mill and plasterboard plant and at Norfolk a calcining plant, which was supplied both with domestic and imported gypsum. Several fertilizer plants in the Norfolk area marketed imported gypsum for agricultural use as land plaster.

Digitized by Google

**Iron Oxide Pigments.**—Crude iron oxide pigments were mined in Virginia in 1956 by American Pigments Corp., at Hiwassee (Pulaski County). Production which was less than in 1955 and consisted of both brown and yellow iron oxide, including sienna, umber, ocher, and natural yellows. Finished iron oxide pigments were produced by two companies in 1956—the American Pigment Corp., plants at Pulaski and Hiwassee, Pulaski County; and Blue Ridge Talc Co., Inc., at Henry, Franklin County. Both natural and manufactured finished pigments were prepared; sales included mineral blacks and browns, red and yellow oxide, ochers, siennas, and umbers.

**Kyanite.**—Kyanite production gained moderately over 1955. The only producer, Kyanite Mining Corp., mined biotite-feldspar schist on Baker Mountain near Farmville (Prince Edward County). This ore was processed at Cullen and Pamplin for use chiefly in firebrick and other special refractories and also in ceramic bodies, including porcelain, kiln furniture, and insulators.

**Lime.**—The output of lime in Virginia continued to grow and in 1956 topped 500,000 short tons valued at nearly $6 million, an increase over 1955 of 4 percent in quantity and 17 percent in value. Ninety-four percent of both the quantity and value of the lime produced was consumed in chemical or other industrial uses. Ninety percent of the total lime sold or used was quicklime. The demand for chemical and industrial lime in Virginia was strong throughout the year, but that for agricultural and building lime was poor. The price increased about 8 percent, effective in October.

Lime manufactured in Virginia was derived from abundant, high-quality limestone deposits in the Shenandoah and other valleys west of the Blue Ridge and from the soft limestone in the eastern part of the State on the Coastal Plain. One plant each in Isle of Wight and Norfolk Counties used oystershell as a raw material. Leading lime producers were: National Gypsum Co. and Standard Lime & Cement Co., Kimballton, Giles County; M. J. Grove Lime Co., Stephens City, Frederick County; and Dominion Limestone Division and Strasburg Lime Co., Division of Chemstone Corp., Strasburg, Shenandoah County. Other counties in which lime was burned were Montgomery and Tazewell.

**TABLE 4.—Lime (quick and hydrated) sold and used by producers, 1947–51 (average) and 1952–56 by types**

| Year | Agricultural | | Building | | Chemical and other industries | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 21,601 | $250,262 | 12,063 | $133,841 | 341,046 | $3,023,346 | 374,710 | $3,407,449 |
| 1952 | 20,151 | 241,139 | 11,566 | 126,428 | 411,128 | 4,081,357 | 442,845 | 4,448,924 |
| 1953 | 19,215 | 243,030 | 10,819 | 117,477 | 447,350 | 4,586,911 | 477,384 | 4,947,418 |
| 1954 | 11,146 | 91,616 | 14,781 | 180,802 | 419,231 | 4,338,227 | 445,158 | 4,610,645 |
| 1955 | 26,945 | 333,464 | 4,355 | 52,034 | 462,993 | 4,663,199 | 494,293 | 5,048,697 |
| 1956 | 25,125 | 322,644 | 3,572 | 41,914 | 483,649 | 5,561,357 | 512,346 | 5,925,915 |

Digitized by Google

**Marl, Calcareous.**—Output of calcareous marl in 1956 was less than in 1955 due to slackened demand for agricultural use. Two producers in Clarke County and one in Surry County again contributed the entire output. The Surry County material was derived from Coastal Plain deposits; the Clarke County product was a travertine marl. Preparation for sale consisted of drying and pulverizing.

**Mica.**—Sheet-mica output was small, substantially less than in 1955. No production of scrap mica was reported. Hand-cobbed and full-trim mica were sold to the Government through General Services Administration by Piedmont Mining Co., Inc., from mines in Goochland and Powhatan Counties and full-trim by Ed Martin from Henry County and W. O. Baltzley from unspecified counties.

**Nitrogen Compounds.**—Production of synthetic nitrogen in Virginia in 1956 was reported by the Allied Chemical & Dye Corp. Nitrogen Division plant at Hopewell (Prince George County). Synthetic sodium nitrate (made by only one other company in the United States), ammonia, ammonium nitrate, and urea solutions, ammonium sulfate and ammonium nitrate-limestone were manufactured. During 1956 the firm also was installing facilities for manufacturing solid ammonium nitrate.[4] The leading market for these nitrogen compounds was in agriculture as fertilizers and fertilizer materials.

**Perlite.**—Perlite was expanded at Hopewell (Prince George County) from raw material shipped from Colorado and New Mexico. Virginia Perlite Corp., the only producer in Virginia, sold this material largely for plaster aggregate; smaller quantities were used for concrete aggregate. Output in 1956 was virtually the same as in 1955; prices for the finished product increased 20 percent.

**Pyrites.**—The Gossan mine in Carroll County, operated by General Chemical Division, Allied Chemical & Dye Corp., produced both lump and fines as concentrate. Output was 5 percent greater in 1956 than in 1955 and was utilized at the company sulfuric acid plant at Pulaski.

**Salt.**—The Olin Mathieson Chemical Co. (Saltville) produced chlorine, soda ash, and other chemicals from brines obtained from underground rock-salt deposits. This company was the only salt producer in Virginia. Production in 1956 was virtually the same as in 1955.

**Sand and Gravel.**—Output of sand and gravel in Virginia in 1956 increased 20 percent in tonnage and 14 percent in value. Street and highway construction and increased commercial and industrial building were the leading factors in the higher production. There were 39 commercial companies and 2 Government-and-contractor agencies producing sand and gravel in Virginia in 1956. The output reported from 30 counties included paving and building sand and gravel, and sizable quantities both of engine sand (mostly from Princess Anne County) and of glass sand (from Frederick and Rockbridge Counties). Paving sand and gravel furnished 52 percent of the total (including Government-and-contractor tonnage) and structural and paving sand and gravel greater than 90 percent of the total quantity sold or used.

[4] Oil, Paint and Drug Reporter, vol. 169, No. 8, Feb. 20, 1956, p 4.

Digitized by Google

The chief sand-and-gravel producing counties include the more important metropolitan areas in the State and in 1956 were as follows (the metropolitan areas are in parentheses): Chesterfield (Richmond), Fairfax (Washington, D. C.), Henrico (Richmond), Prince George (Petersburg-Hopewell), Spotsylvania (Fredericksburg), and Princess Anne (Norfolk-Portsmouth). The leading producers in the State in 1956 were: Southern Materials Co., Inc., Chesterfield County; Modern Sand & Gravel Corp., Northern Virginia Construction Co., Inc., C. R. Vaughan, Inc., and Virginia Sand & Gravel Co., Inc., Fairfax County; Commonwealth Sand & Gravel Corp. and West Sand & Gravel Co., Inc., Henrico County; Bryan Rock & Sand Co., Prince George County; and Massaponax Sand & Gravel Corp., Spotsylvania County.

**TABLE 5.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average per ton | | Tota | Average per ton |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | 1,448,193 | $1,589,376 | $1.10 | (1) | (1) | (1) |
| Paving | 1,038,633 | 697,280 | .67 | 1,456,852 | $1,094,523 | $0.75 |
| Engine | (1) | (1) | (1) | 81,089 | 81,510 | 1.01 |
| Other | 37,708 | 38,105 | 1.01 | 26,294 | 29,592 | 1.13 |
| Gravel: | | | | | | |
| Building | 1,590,708 | 2,617,937 | 1.65 | 1,788,653 | 2,840,894 | 1.59 |
| Paving | 1,834,978 | 2,199,932 | 1.20 | 2,475,759 | 2,689,551 | 1.09 |
| Other | | | | 8,500 | 15,300 | 1.80 |
| Undistributed [2] | 344,225 | 825,761 | 2.40 | 1,795,302 | 2,379,964 | 1.33 |
| Total sand and gravel | 6,294,445 | 7,968,391 | 1.27 | 7,632,449 | 9,131,334 | 1.20 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | | | | 30,056 | 15,281 | .51 |
| Paving | 52,321 | 21,503 | .41 | 22,393 | 8,553 | .38 |
| Gravel: | | | | | | |
| Paving | 114,120 | 86,210 | .76 | 98,205 | 85,239 | .87 |
| Total sand and gravel | 166,441 | 107,713 | .65 | 150,654 | 109,073 | .72 |
| Grand total | 6,460,886 | 8,076,104 | 1.25 | 7,783,103 | 9,240,407 | 1.19 |

[1] Figure withheld to avoid disclosing individual company confidential data; included in "Undistributed."
[2] Includes glass, molding (1955), filter (1955), railroad ballast sand (1955), and those uses indicated by footnote 1.

**Slate.**—Output of slate in Virginia was only slightly higher than in 1955, but value rose over 25 percent to more than $1 million. Higher wages in the industry led to higher prices and also to somewhat reduced demand for slate products. Roofing slate and flagging increased in quantity in 1956 over 1955 by 3 and 25 percent, respectively; granules were less than in 1955. Virginia slate, usually dark gray with greenish or brownish tints, was mined from quarries in Albemarle and Buckingham Counties. One company prepared roofing granules from slate in both counties, and three other firms in Buckingham County marketed roofing and flagging slate.

Digitized by Google

**Soapstone.**—Considerably less ground soapstone was produced in 1956 than in 1955. Statistics of dimension soapstone are included under the Stone section in this chapter. Two firms ground soapstone for use chiefly in insecticides, foundry facings, rubber, and roofing; they were Blue Ridge Talc Co., Inc., Henry, Franklin County; and Alberene Stone Corp., Schuyler, Nelson County.

**TABLE 6.—Stone sold or used by producers, 1955–56, by kinds and uses**

| Kind and use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Dimension stone: Sandstone, all uses | 433 | $4,465 | 507 | $4,895 |
| Crushed and broken stone: | | | | |
| Granite: | | | | |
| Riprap | | | 135,798 | 225,947 |
| Concrete and roadstone | (1) | (1) | 1,425,662 | 2,268,458 |
| Other uses [2] | 1,352,539 | 1,878,536 | 399,790 | 453,880 |
| Basalt and related rocks: Concrete and roadstone | 707,302 | 1,184,604 | 743,884 | 1,249,759 |
| Limestone: | | | | |
| Fluxing stone | 547,182 | 845,515 | 578,099 | 962,951 |
| Concrete and roadstone | 4,519,086 | 6,034,403 | 5,432,119 | 7,298,612 |
| Railroad ballast | 348,871 | 408,460 | 472,758 | 551,394 |
| Agriculture | 585,165 | 1,134,031 | 593,481 | 1,132,630 |
| Miscellaneous [3] | 3,712,066 | 5,728,984 | 4,035,141 | 5,889,277 |
| Undistributed [4] | 193,246 | 2,650,677 | 264,665 | 3,037,792 |
| Total | 11,965,890 | 19,869,675 | 14,081,904 | 23,075,595 |

[1] Included with "Other uses" to avoid disclosing individual company confidential data.
[2] Includes railroad ballast.
[3] Includes riprap.
[4] Includes miscellaneous dimension stone, miscellaneous crushed and broken stone including concrete and roadstone, crushed and broken marble, and crushed sandstone and shell.

**Stone.**—In production and value, stone continued to rank second among the minerals produced in Virginia. In comparison with 1955, output and value increased 18 and 16 percent, respectively, owing mostly to increased demand for stone used as concrete aggregate and roadstone—the principal use of Virginia's stone. Varieties of stone produced in Virginia in 1956 were basalt, granite, limestone, marble, sandstone, and miscellaneous stone. Of these, limestone supplied by far the greater part (79 percent) of the State's total stone production. Leading stone-producing counties were: Botetourt, Nelson, Smyth, and Greensville, in decreasing order of value.

Virginia stone output was produced in 35 counties by 59 commercial operators and 6 State and municipal agencies from 65 quarries and mines. Of the commercial producers 44 produced limestone at 50 quarries, 4 quarried basalt (diabase), 5 granite, 1 marble, 2 sandstone, and 3 miscellaneous stone (dimension greenstone and soapstone 1 each and crushed stone 1). Limestone was mined in 23 of the 98 counties in the State.

## METALS

**Beryllium Concentrate.**—One firm in Powhatan County produced beryllium concentrate. Production increased 7 percent in quantity and 17 percent in value over 1955. It was sold to the Government Spruce Pine (N. C.) Purchase Depot, administered by General Services Administration (GSA).

**Lead and Zinc.**—Output of recoverable lead in Virginia in 1956 rose slightly in tonnage and 7 percent in value over 1955. Production of

Digitized by Google

recoverable zinc was 5 percent higher in quantity and 15 percent higher in value than in 1955 and represented the highest output since 1941. In 1956 these two metals were recovered from Wythe County zinc-lead ore, which was treated in a 2,000-ton-per-day mill at Austinville, producing zinc and lead concentrates. The zinc concentrate was shipped to plants at Palmerton, Pa.; and East Chicago, Ind. Lead concentrate was shipped to Palmerton, Pa.; and Federal, Ill. Progress in dewatering the Arminius mine at Mineral (Louisa County) allowed deepening of the main shaft as a further aid in planning redevelopment of the property.

A descriptive report on the nine chief sulfide-ore areas in Virginia included discussions of the types of ore and occurrence for each, a brief historical summary of sulfide mineralization, and the production record of metals in these regions. The largest single zone of sulfide mineralization is the Great Gossan Lead in Western Carroll County.[5] The nature and extent of sulfide mineralization in Rockingham and Shenandoah Counties in the Shenandoah Valley were presented in a detailed study of the geology, mineralogy, and location of deposits, using the results of core-drilling and other exploratory work by Tri-State Zinc, Inc.[6]

Exhaustive mineral-dressing tests on the Great Gossan ore from the Betty Baker mining area in Carroll County revealed that a combination of flotation and roasting and leaching extractive techniques would effect the most complete use of the minerals. The Betty Baker ore is complex. It was suggested that these methods of treatment might be adapted to successful mineral recoveries on the other less complicated ores of this mineralized belt. Copper, zinc, lead, and iron and possibly some byproduct manganese were present in the ore.[7] The projected erection of a $400,000 plant to mine and concentrate zinc ore near Timberville in northwestern Rockhingham County by Tri-State Zinc, Inc., was announced. This firm also operated mines and a zinc concentrate plant at Galena, Ill.

**TABLE 7.—Mine production of recoverable lead and zinc, 1947–51 (average) and 1952–56**

| Year | Lead | | Zinc | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 3,316 | $1,045,239 | 13,113 | $3,548,358 |
| 1952 | 3,792 | 1,221,024 | 13,409 | 4,451,788 |
| 1953 | 2,788 | 730,456 | 16,676 | 3,835,480 |
| 1954 | 4,320 | 1,183,680 | 16,738 | 3,615,408 |
| 1955 | 2,997 | 893,106 | 18,329 | 4,508,934 |
| 1956 | 3,035 | 952,990 | 19,196 | 5,180,616 |

**Manganese Ore.**—Production of manganese ore in Virginia in 1956 dropped 38 percent in quantity compared with 1955. Virtually all of the 35 percent or more manganese was metallurgical ore, which was shipped mostly to GSA under the Government carlot program. Difficulties in meeting Government specifications, higher prices of

[5] Young, Robert S., Sulfides in Virginia: Virginia Minerals, vol. 2, No. 1, January 1956, pp. 1-7.
[6] Herbert, Paul, Jr., and Young, Robert S., Sulfide Mineralization in the Shenandoah Valley of Virginia: Virginia Div. of Geol., Bull. 70, Charlottesville, Va., 1956, 58 pp.
[7] Corriveau, M. P., Mineral-Dressing Studies on the Great Gossan Lead Ore from Carroll County, Virginia: Virginia Polytech. Inst. Eng. Exp. Sta. Ser. 113, Blacksburg, Va., 1956, 79 pp.

Digitized by Google

equipment and supplies, and lack of a buying program for lower grade manganese were listed by producers as hindering mining and disposal of the product. Washing to improve grade was general, and some producers used dense-medium separation to further process their material. The larger active producers in 1956 were: South River Mining Co., Inc., Augusta County; J. Gordon Gusler, Giles County; Manganese Mining & Contracting Co., National Manganese Co., Inc., Sidney Manganese Corp., and Umbarger Manganese Co., Smyth County; and Colitz Mining Co., Inc., Washington County. The leading producing counties were Smyth, Washington, and Augusta. Other counties where manganese ore was mined in 1956 were: Appomattox, Bland, Campbell, Frederick, Giles, Page, and Rockbridge.

**TABLE 8.—Manganese and manganiferous ores shipped from mines, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | [1] 11 | $320 | 1954 | 22,678 | $1,780,934 |
| 1952 | 1,011 | (2) | 1955 | 32,654 | 2,779,337 |
| 1953 | 8,454 | 635,926 | 1956 [3] | 20,231 | 1,901,983 |

[1] In addition, there was an average output of 1,990 tons of ferruginous manganese ore valued at $15,886 in 1947–51.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Incomplete total; excludes a small quantity of ferruginous manganese ore.

**Silver.**—The zinc-lead ore mined at Austinville (Wythe County) yielded silver as a byproduct of beneficiation. Production of silver was slightly higher in 1956 than in 1955.

**Titanium Concentrate (Ilmenite).**—Production of ilmenite in Virginia in 1956 rose 7 percent in both quantity and value compared with 1955. American Cyanamid Co. near Piney River (Amherst County) produced the entire output for consumption in its adjacent titanium-pigments-preparation plant. Characteristics, uses, geology, modes of occurrence (with special reference to Virginia occurrence) periods of development of titanium in foreign countries and the United States production, and future production possibilities were discussed in a published report.[8] A plant to produce rutile and ilmenite near Montpelier, Hanover County, will be built by Metal & Thermit Corp., New York. It was estimated that the mine and processing plant would cost $750,000.[9]

## REVIEW BY COUNTIES

**Albemarle.**—Charlottesville Stone Corp. quarry and crusher near Charlottesville produced crushed and broken basalt for concrete aggregate and roadstone. Crushed and broken granite used for concrete aggregate, roadstone, railroad ballast, and stone sand was produced by Superior Stone Co. (Red Hill). The United Brick Corp. open-pit mine near Woodbridge Station produced clay for heavy clay products. S. L. Williamson Co., Inc. (Charlottesville) produced paving sand and gravel for road construction from dredging, and Superior Stone

[8] Pegau, Arthur A., Titanium: Virginia Div. of Min. Resources, Min. Res. Circ. 5, Charlottesville, Va., 1956, 17 pp.
[9] Steel, vol. 138, No. 9, Feb. 27, 1956, p. 100.

Digitized by Google

(North Garden) produced paving gravel for road construction. Blue Ridge Slate Corp. quarried and crushed slate for granules at Esmont.

**Alleghany.**—Virginia Department of Highways produced paving gravel in 1956.

**TABLE 9.—Value of mineral production in Virginia, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Accomack | $20,518 | | Sand and gravel. |
| Albemarle | (3) | (3) | Stone, clays, slate, sand and gravel. |
| Alleghany | 290 | $1,559 | Sand and gravel. |
| Amelia | 119 | | Gem stones. |
| Amherst | (3) | (3) | Titanium, aplite, sand and gravel. |
| Appomattox | (3) | (3) | Stone, manganese, sand and gravel. |
| Augusta | (3) | (3) | Cement, stone, manganese, sand and gravel, clays. |
| Bedford | (3) | (3) | Feldspar. |
| Bland | 314,921 | 63,007 | Manganese. |
| Botetourt | (3) | (3) | Cement, stone, clays. |
| Brunswick | | (3) | Stone. |
| Buchanan | 40,356,855 | 45,599,393 | Coal. |
| Buckingham | 758,721 | (3) | Slate, sand and gravel. |
| Campbell | (3) | (3) | Stone, manganese, sand and gravel. |
| Carroll | (3) | (3) | Pyrites. |
| Charlotte | 713 | 55 | Sand and gravel. |
| Chesterfield | (3) | (3) | Sand and gravel, clays. |
| Clarke | (3) | 12,000 | Calcareous marl. |
| Culpeper | (3) | 184,000 | Stone, sand and gravel. |
| Cumberland | | 5,260 | Sand and gravel. |
| Dickenson | 17,927,551 | 25,460,407 | Coal. |
| Fairfax | 2,408,204 | 2,195,050 | Sand and gravel, oystershell. |
| Fauquier | 586,965 | 500,168 | Stone. |
| Franklin | 12,163 | (3) | Soapstone. |
| Frederick | 1,629,027 | 1,611,669 | Stone, lime, sand and gravel, clays, manganese. |
| Giles | 5,068,991 | (3) | Lime, stone, manganese. |
| Goochland | 360,000 | 650,641 | Stone, mica. |
| Greensville | (3) | 1,031,002 | Stone. |
| Halifax | | 989 | Sand and gravel. |
| Henrico | (3) | (3) | Sand and gravel, clays. |
| Henry | 16,952 | (3) | Stone, mica. |
| Isle of Wight | 75,637 | 78,017 | Lime, oystershell. |
| King William | (3) | (3) | Sand and gravel. |
| Lee | 4,225,610 | (3) | Coal, stone. |
| Loudoun | 364,604 | 444,822 | Stone. |
| Madison | 195 | | Gem stones. |
| Montgomery | 623,138 | 680,589 | Stone, coal, clays, lime. |
| Nansemond | (3) | (3) | Clays. |
| Nelson | (3) | (3) | Stone, aplite, sand and gravel, soapstone. |
| Norfolk | (3) | (3) | Cement, lime, oystershell, sand and gravel. |
| Nottoway | 130,000 | 175,000 | Stone. |
| Orange | (3) | (3) | Stone. |
| Page | | 3,235 | Manganese. |
| Pittsylvania | (3) | 115,151 | Stone, sand and gravel. |
| Powhatan | (3) | 3,301 | Mica, beryl. |
| Prince Edward | (3) | (3) | Kyanite, sand and gravel. |
| Prince George | (3) | 706,403 | Sand and gravel. |
| Prince William | (3) | (3) | Stone, clays. |
| Princess Anne | 301,651 | 255,885 | Sand and gravel. |
| Pulaski | (3) | (3) | Iron oxide pigments. |
| Roanoke | (3) | (3) | Stone, clays, sand and gravel. |
| Rockbridge | 1,220,972 | 1,324,551 | Stone, sand and gravel, clays, manganese. |
| Rockingham | 574,581 | (3) | Stone, sand and gravel. |
| Russell | 4,889,330 | (3) | Coal, stone. |
| Scott | (3) | (3) | Stone, coal. |
| Shenandoah | 799,066 | 1,549,408 | Lime, stone. |
| Smyth | 5,172,232 | 4,944,989 | Salt, stone, manganese, sand and gravel, clays. |
| Spotsylvania | (3) | 273,406 | Sand and gravel. |
| Surry | 320 | 220 | Calcareous marl. |
| Tazewell | 16,440,792 | 22,324,738 | Coal, stone, lime, clays. |
| Warren | (3) | (3) | Cement, stone. |
| Washington | 2,275,673 | 2,063,915 | Gypsum, stone, manganese, sand and gravel. |
| Westmoreland | (3) | (3) | Sand and gravel. |

See footnotes at end of table.

Digitized by Google

TABLE 9.—Value of mineral production in Virginia, 1955–56, by counties [1]—Con.

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Wise | $25,552,644 | (3) | Coal, stone. |
| Wythe | (3) | (3) | Zinc, lead, stone, silver. |
| York | | (3) | Sand and gravel. |
| Undistributed [4] | 40,432,937 | $95,547,092 | |
| Total [5] | 172,541,000 | 208,806,000 | |

[1] The following counties are not listed, because no production was reported: Arlington, Bath, Caroline, Charles City, Craig, Dinwiddie, Elizabeth City, Essex, Floyd, Fluvanna, Gloucester, Grayson, Greene, Hanover, Highland, James City, King and Queen, King George, Lancaster, Louisa, Lunenburg, Mathews, Mecklenburg, Middlesex, New Kent, Northampton, Northumberland, Patrick, Rappahannock, Richmond, Southampton, Stafford, and Sussex, Warrick.

[2] Value of fuels, including coal for certain counties in 1955, petroleum, and natural gas, included with "Undistributed."

[3] Figure withheld to avoid disclosing individual company confidential data.

[4] Includes value of gem stones in 1955, part of the value of manganese ore and mica, petroleum and natural gas and values indicated by footnote 3; for these commodities complete distribution by counties was not available.

[5] Total adjusted to eliminate duplicating the value of clays and stone.

**Amherst.**—American Cyanamid Co. produced ilmenite for consumption in its titanium-pigment plant at Piney River. Output of the raw material in 1956 was higher than in 1955. This was the only production of titanium concentrate in Virginia. The Riverton Lime & Stone Co. Division, Chadbourn Gotham, Inc. (formerly Dominion Minerals Division, Riverton Lime & Stone Co., Inc.), mined aplite in Amherst County near Piney River and processed it in a nearby mill in Nelson County for use in glass. J. M. Smiley, Lynchburg, again produced building sand by dredging. The Virginia Highway Department produced paving gravel.

**Appomattox.**—Appomattox Stone Corp., Appomattox, and the Virginia Department of Highways produced limestone for concrete aggregate, roadstone, and agricultural purposes. The Southeastern Manganese Co. mined metallurgical manganese ore from its Nuttall mine near Lynchburg. Paving sand was produced by Virginia Department of Highways.

**Augusta.**—Lehigh Portland Cement Co. operated a portland-cement plant near Fordwick. Masonry mortar also was produced. General-use and moderate-heat and a lesser quantity of high-early-strength cement were burned in the six-kiln plant. Finished material was distributed largely to Virginia destinations. Crushed limestone used for cement production, concrete aggregate, roadstone, and asphalt filler was quarried during the year. Producers were Lehigh Portland Cement Co. (quarry and cement plant near Fordwick), Belmont Trap Rock Co., Inc., Augusta Stone Corp., Valley Stone, and Virginia Department of Highways, all operating near Staunton. Valley Stone began producing during 1956 at the Old James quarry and crusher. Active producers of 35-percent or more manganese ore in Augusta County were the Mountain Top Mining Co., at its Mountain Top mine near Waynesboro, Parker Manganese Co. at its Crimora mine, Crimora, and South River Mining Co., Inc., near Vesuvius. The ore was all Metallurgical grade, and by far the largest part was purchased through the General Services Administration under the Defense Production Act carlot program. North American Brick Co., near Staunton mined miscellaneous clay and shale for heavy clay

Digitized by Google

products. F. R. Weeks, Raphine, produced building sand for road construction, and the Virginia Department of Highways produced paving gravel.

**Bedford.**—In Virginia, feldspar was produced only in Bedford County by The Clinchfield Sand & Feldspar Corp. at four open-pit mines—Clayton, Coles, Mitchell, and Peaksville. The Coles and Clayton mines yielded potash feldspar; the Peaksville, soda feldspar; and the Mitchell, mixed soda and potash feldspar. The raw feldspar, produced from these mines and one North Carolina mine, was ground in the company mill at Bedford and sold for ceramic products, including pottery and enamel.

**Bland.**—Manganese ore was mined in 1956 in Bland County by Bluefield Mining Corp. and the Southern Manganese Corp.

**Botetourt.**—Botetourt County led Virginia stone-producing counties. Limestone, used mainly for cement, concrete aggregate, and roadstone, was quarried at five operations in the county. Producers were Lone Star Cement Corp. at a quarry and cement plant, Cloverdale; Blue Ridge Stone Corp., Blue Ridge; James River Hydrate & Supply Corp., Buchanan; and Liberty Limestone Corp. at Rocky Point and Sherwood quarries near Rocky Point and Buchanan, respectively. Other uses of limestone quarried in the county included: Agricultural, railroad ballast, blast-furnace flux, alkali, rock dust for coal mines, stone sand, and filler for asphalt and fertilizer. Liberty Limestone Corp. was inactive from July 26 to September 10 due to a labor dispute. Lone Star Cement Corp. produced general-use and moderate-heat and high-early-strength cement at its four-kiln plant at Cloverdale. (The fourth kiln was placed in operation in September.) Masonry cement also was produced there. Roanoke-Webster Brick Co., Inc. (Roanoke), and Virginia Lightweight Aggregates Corp. (Webster), produced miscellaneous clay at their open-pit mines. This material was used in heavy clay products and for concrete and lightweight aggregate.

**Brunswick.**—Bryan Rock & Sand Co. of Raleigh, N. C., at the Rawlings quarry near Rawlings produced crushed granite for concrete aggregate, roadstone, and screenings.

**Buchanan.**—Buchanan County again led in producing bituminous coal in Virginia in 1956; the output was over 9 million tons. Production from 550 mines increased 6 percent in tonnage and 13 percent in value over 1955. The following companies are listed according to production value: Jewell Ridge Coal Corp. (two mines), Island Creek Coal Co., Harman Mining Corp., Sycamore Coal Co. (Buccaneer), Preston Mining Co., Paragon Jewell Coal Co., Inc., Panther Coal Co., Inc., Hi-Grade Coal Co., Knox Creek Coal Co., and Wellmore Coal Co.

**Buckingham.**—Blue Ridge Slate Corp. produced slate granules at its Dutch Gap quarry at Bremo Bluff. Slate for roofing, flagging, and other uses was quarried by Arvonia-Buckingham Slate Co., Inc., LeSueur-Richmond Slate Corp., and Williams Slate Co. (all of Arvonia). Structural sand was produced by Virginia Department of Highways in 1956.

**Campbell.**—Virginia Greenstone Co., Inc., produced Virginia Greenstone at its quarry and fabricating mill in Lynchburg. Output was used as rough and dressed building stone and as dimension laboratory-

Digitized by Google

table tops, sinks, tubs, and bakery hearths. Crushed and broken greenstone was used for flagging and miscellaneous purposes. Two new limestone quarries and crushers began operating in Campbell County—Blue Ridge Stone Corp. and Rockydale Stone Service Corp. near Lynchburg and Concord, respectively. Output from both companies was used for concrete aggregate and roadstone. Manganese was produced by William H. Irvine near Evington. Paving sand was produced by the Virginia Department of Highways.

**Carroll.**—Pyrites was produced at the Gossan mine at Cliffview near Galax by General Chemical Division, Allied Chemical & Dye Corp. This material was used in making sulfuric acid at Pulaski.

**Charlotte.**—The Norfolk and Western Railway Co. produced a small quantity of sand for unspecified use in Charlotte County.

**Chesterfield.**—Southern Materials Co., Inc., again reported a substantial tonnage of building and paving sand and gravel from dredging on the James River near Dutch Gap. An output of miscellaneous clay mined from an open pit near Richmond was reported by Southside Brick Works, Inc.

**Clarke.**—A. C. Strother, Berryville, and J. C. Digges & Sons (White Post, near Berryville) dried and pulverized calcareous marl for agricultural use.

**Culpeper.**—Culpeper Stone Co. quarried stone, which was crushed or broken for riprap, concrete aggregate, and road material near Culpeper. Building and paving sand and gravel was produced by the Culpeper Sand Co. (Culpeper).

**Cumberland.**—Structural sand was produced by Virginia Department of Highways.

**Dickenson.**—Dickenson County again ranked third among Virginia's 8 coal-producing counties; it produced over 4 million tons. The output was chiefly from underground mines. The leading producer in the county was again Clinchfield Coal Co. at underground, strip, and auger mines. Other leading producers were: Baker Coal Co., Cassell Coal Co., Lambert Coal Co., R. & M. Coal Co., Luther Sauls Coal Co., Dickenson Fuel Co., Dotson Bros. Coal Co., Helen Coal Co., Crabtree Coal Co., and Neece Creek Coal Co.

**Fairfax.**—Building sand and gravel was produced by Modern Sand & Gravel Corp., Northern Virginia Construction Co., Inc., Virginia Sand & Gravel Co., Inc., and Belvoir Sand & Gravel Co. (all with offices in Alexandria). Hilltop Sand & Gravel Co., Inc., produced building and paving sand and gravel. Clem Road Gravel Co. and C. R. Vaughan, Inc., produced paving gravel. Herbert Bryant, Inc. (Alexandria), produced crushed oystershell for poultry grit and lime. Statistics for this material were included under stone.

**Fauquier.**—Crushed limestone for concrete aggregate and roadstone was produced by Millbrook Quarries, Inc. (Broad Run). W. W. Sanders produced crushed basalt for concrete aggregate and road material. Sandstone used for rough construction and flagging was quarried by John Costello (The Plains).

**Franklin.**—Blue Ridge Talc Co., Inc. (Henry), produced soapstone for grinding stock at its King-Ramsey quarry. The product after grinding was sold for insecticides and foundry facings. Finished iron oxide pigments, including mineral blacks and browns, red and yellow

Digitized by Google

oxides, ochers, umbers, and siennas, also were marketed by this company.

**Frederick.**—Stuart M. Perry, Inc. (Winchester), and M. J. Grove Lime Co. (Stephens City and Middletown), produced limestone. Output was used for concrete aggregate, road material, blast-furnace and open-hearth flux, agricultural purposes, glass, and other miscellaneous uses. Lime for building, agricultural, and chemical uses was produced by M. J. Grove Lime Co. at its Stephens City plant. Hott & Miller mined metallurgical manganese ore at the Mineral Ridge mine near Star Tannery. Virginia Glass Sand Corp. recovered glass and building sand at a pit near Gore. The Shenandoah Brick & Tile Corp. open-pit mine near Winchester produced miscellaneous clay for use in heavy clay products.

**Giles.**—During 1956 the Kimballton plants of National Gypsum Co. and Standard Lime & Cement Co. and the Ripplemead plant of Ripplemead Lime Co., Inc., produced lime for building, agricultural, and chemical purposes. In addition to lime production these companies and Virginia Limestone Corp. (Ripplemead) quarried limestone for lime manufacture, concrete aggregate, road material, blast-furnace flux, railroad ballast, agricultural purposes, and various other uses. J. Gordon Gusler mined manganese ore of 35-percent or more manganese content near Newport.

**Goochland.**—Boscobel Granite Co. produced crushed stone for concrete aggregate, road material, and screenings at its granite quarry at Manakin. Small quantities of full-trim mica produced from the Amber Queen and Donna mines near Goochland were sold to the Government (GSA) Spruce Pine (N. C.) Purchase Depot by Piedmont Mining Co., Inc. (Powhatan).

**Greensville.**—Crushed and broken granite used for concrete aggregate, road material, railroad ballast, riprap, and stone sand was produced near Emporia by Trego Stone Corp.

**Halifax.**—Virginia Department of Highways produced a small quantity of paving sand in 1956.

**Henrico.**—Building and paving sand and gravel was produced in Henrico County by Commonwealth Sand & Gravel Corp. and West Sand & Gravel Co., Inc., of Richmond. The Henrico County Highway Department produced paving sand and gravel. Miscellaneous clay for heavy clay products was produced at the open-pit mines of Redford Brick Co. and Daniels Brick & Tile Co. (both of Richmond).

**Henry.**—Crushed and broken granite used for concrete aggregate and road material was produced by the City of Martinsville for its own use. A small quantity of full-trim mica produced at the Nance mine near Axton by Ed. Martin was sold to the Government (GSA) Spruce Pine (N. C.) Purchase Depot.

**Isle of Wight.**—Battery Park Fish & Oyster Co. (Battery Park) produced agricultural lime from oystershell at Smithfield.

**King William.**—Building and paving sand and gravel was produced in 1956 by Fox Co., Aylett. Reporting production of paving sand and gravel and miscellaneous sands for the first time was Mattaponi Sand & Gravel at Beulahville.

**Lee.**—Lee County again ranked sixth among Virginia's eight coal-producing counties. Leading producers were Blue Diamond Coal

Digitized by Google

Co., Benvir Coal Co., Virginia Lee Colliery, Penn Darby Coal Co., Peabody Coal Co., Kemmerer Gem Coal Co., Laurel Branch Coal Co., Walter Bledsoe, Lewis Coal Co., and Moran Lewis Coal Co. Crushed and broken limestone was produced by Kentucky Virginia Stone Co. (Gibson Station) and Woodway Quarries (Woodway) for use as riprap, concrete aggregate, road material, railroad ballast, and as dust for coal mines.

**Loudoun.**—Arlington Stone Co. (Leesburg) quarried basalt used as concrete aggregate and roadstone. The Virginia Department of Highways quarried basalt and miscellaneous stone for use as concrete aggregate and road material.

**Louisa.**—Progress in unwatering the Arminius mine of the New Jersey Zinc Co. at Mineral allowed the deepening of the main shaft, which action further aided planned redevelopment of this lead-zinc property.

**Montgomery.**—Producers of crushed limestone were Radford Limestone Co., Inc., (Radford); and Montgomery Lime Co., Inc., (Ellett). Output was used for concrete aggregate, roadstone, railroad ballast, agricultural purposes, and other miscellaneous uses. The City of Radford produced limestone for its own use as concrete aggregate and roadstone. The Ellett plant of Montgomery Lime Co., Inc., also produced a small quantity of lime for agricultural purposes using limestone from its own quarry as raw material. The Old Virginia Brick Co., Inc., open pit near Salem produced miscellaneous clay for heavy clay products in 1956. Montgomery County was again the only county in Virginia to produce semianthracite.

**Nansemond.**—The Roanoke-Webster Brick Co., Inc., open-pit mine near Suffolk produced miscellaneous clay for heavy clay products.

**Nelson.**—Soapstone was quarried near Schuyler by Alberene Stone Corp. of Virginia. Output was marketed mainly as dressed dimension stone for laboratory and architectural use and for flagging; a sizeable quantity was crushed or ground for use in rubber and roofing compositions, or as miscellaneous filler. The Virginia Department of Highways produced paving gravel in Nelson County. Consolidated Feldspar Department, International Minerals & Chemical Corp. mined and ground aplite in an adjacent mill in Nelson County. Similar material mined in Amherst County by Riverton Lime & Stone Co. Division, Chadbourn Gotham, Inc. (formerly Dominion Minerals Division, Riverton Lime & Stone Co.), was ground in a mill in Nelson County, also near Piney River. The ground aplite was sold to glassmakers, principally because of its high alumina content.

**Norfolk.**—The United States Gypsum Co. operated a calcining plant at Norfolk and some fertilizer dealers in that area imported raw gypsum for use chiefly as land plaster. These firms included: Baugh & Sons, Portsmouth; and Charles W. Priddy & Co. Inc., F. S. Royster Guano Co., and Smith Douglass Co. Inc., all of Norfolk. Lone Star Cement Corp. produced general-use and moderate-heat and masonry cement at its three-kiln plant at South Norfolk.[10] Marl was used as raw material in its manufacture. Reliance Fertilizer & Lime Corp. (South Norfolk) produced agricultural lime. Randolph B. Cooke produced a small tonnage of engine sand in Norfolk County.

[10] Although South Norfolk is an independent city, it is included in Norfolk County.

Digitized by Google

Oystershell was marketed for filter beds by Ballard Fish & Oyster Co. (Norfolk). J. H. Miles & Co. (Norfolk) also sold oystershell for road building and for lime.

**Nottoway.**—Burkeville Stone Co., Inc., near Burkeville, quarried and crushed granite for concrete aggregate and road material.

**Orange.**—Royal Stone Corp. quarried stone (epidote) near Orange for use as concrete aggregate and roadstone.

**Page.**—Compton Manganese Corp. produced some 35-percent-or-more-grade manganese ore in Page County; the specific mine location was not reported.

**Pittsylvania.**—Granite used as riprap was produced by the City of Danville for local use. Kendall Sand Works produced paving sand at its portable plant in Danville and the Marshall Sand Co. fixed plant at Danville produced structural and miscellaneous sands.

**Powhatan.**—Beryl was recovered by Piedmont Mining Co., Inc., from its Baltzley No. 3 mine near Powhatan. Piedmont Mining Co., Inc., also produced some hand-cobbed and full-trim sheet mica from the same mine and sold it to the Government through the GSA Spruce Pine (N. C.) Mica Depot.

**Prince Edward.**—Kyanite Mining Corp., the only producer in Virginia, mined kyanite from an open pit on Baker Mountain near Farmville. Two grinding mills owned by the company (one at Cullen and the other at Pamplin) prepared the raw material for shipment to refractories manufacturers and makers of ceramic bodies such as firebrick, insulators, and porcelain. The mining and milling of this firm including the flowsheets of the concentration processes and of mullite preparation, was described in detail in a publication[11]. The Virginia Department of Highways produced building sand in 1956.

**Prince George.**—Arthur Hitch (Hopewell) produced paving and road gravel in Prince George County in 1956. Friend Sand & Gravel Co., Inc., and Bryan Rock & Sand Co. (Petersburg) produced paving and building sand and gravel. The Nitrogen Division of the Allied Chemical & Dye Corp. (Hopewell) produced various nitrogen compounds, such as ammonia, ammonium sulfate, and ammonium nitrate-limestone. This plant was 1 of 2 producers of sodium nitrate; during the latter part of the year facilities were being installed to produce solid ammonium nitrate, in addition to its current output of ammonium nitrate and urea solutions. Virginia Perlite Corp. (also at Hopewell) expanded perlite from Colorado and New Mexico for sale as plaster and concrete aggregate.

**Prince William.**—Miscellaneous clay used for heavy clay products was recovered at an open pit of the Woodbridge Clay Products Co. Inc. (Woodbridge). Fairfax Quarries, Inc., produced basalt near Manassas for use as concrete aggregate and roadstone.

**Princess Anne.**—Building and engine sands and sands for fertilizer and fill were produced in Princess Anne County by J. C. Jones Sand Co., Inc., Oceana; Tidewater Sand Co., Inc., Little Creek; and Little Creek Sand & Gravel Co. and E. V. Williams Co., Inc., Norfolk.

**Pulaski.**—Hiwassee Pigments Corp. (Hiwassee) produced crude iron oxide pigments, including sienna, umber, ocher, and natural yellow oxides.

---

[11] Corriveau, Martial P., Kyanite Recovery at Baker Mountain, Va.: Mineral Industries Jour.(Virginia Polytech. Inst., Blacksburg, Va.), vol. 2, No. 4, December 1955, pp. 1-4.

Digitized by Google

**Roanoke.**—Rockydale Stone Service Corp. produced limestone for concrete aggregate, roadstone, and agricultural purposes. Old Virginia Brick Co., Inc., recovered miscellaneous clay used in heavy clay products at an open-pit mine near Salem. Building sand was produced by Marl & Stone Corp. (Salem), and Rockydale Stone Service Corp. produced some engine sand.

**Rockbridge.**—W. G. Mathews, Jr., Inc., quarried quartzite near Greenlee for use in preparing ferrosilicon and as railroad ballast. Byproduct sand was also recovered for use in mixing mortar and concrete. Limestone used as railroad ballast, concrete aggregate, and roadstone, was quarried by Charles W. Barger & Son, Lexington; and Lone Jack Limestone Co. Inc., Glasgow. The Locher Silica Corp. plant near Goshen produced glass and building sand. Virginia Department of Highways produced paving gravel in Rockbridge County. An open-pit mine for producing miscellaneous clay was operated by Locher Brick Co., Glasgow. Ivanhoe Mining & Smelting Corp. produced both 10 to 35 percent and 35 percent or more manganese ore from its Midvale mine near Buena Vista. This material was shipped partly for Government and partly for private account.

**Rockingham.**—Jamison Black Marble Co. of Roanoke—the only marble producer in Virginia—quarried marble for use chiefly as terrazzo. Crushed and broken limestone used for concrete aggregate, roadstone, and agricultural purposes was produced by Frank K. Betts, III, A. Y. Frazier, both of Harrisonburg; and C. S. Mundy Quarries, Inc., Broadway. Virginia Department of Highways produced paving sand and gravel in Rockingham County in 1956.

**Russell.**—Bituminous-coal production in Russell County in 1956 increased 45 percent in tonnage and 41 percent in value compared with 1955; output came chiefly from underground mines. The leading producers were Clinchfield Coal Corp., Turner Coal Co., Smith Coal Co., Castle Coal Co., Ben Sword & Willard Ball, J. C. Vance Coal Co., G. & H. Coal Co., Nash Coal Co., and Russell Coal Co. Clinch River Quarries (St. Paul) quarried limestone for use as concrete aggregate and roadstone.

**Scott.**—Limestone used for railroad ballast, concrete aggregate, and roadstone was quarried near Clinchport by Natural Tunnel Stone Co. Penn-Dixie Cement Corp. quarried limestone in Scott County for use in its cement plant at Kingsport, Tenn. A small quantity of coal was produced from five operations in 1956.

**Shenandoah.**—The two lime producers in Shenandoah County—Dominion Limestone, Inc., and Strasburg Lime Co., Inc., both of Strasburg—were absorbed by Chemstone Corp. They will be known as Dominion Limestone Division, Chemstone Corp., and Strasburg Lime Division, Chemstone Corp., respectively. They produced chemical and industrial lime for paper, water purification, and metallurgical purposes and an asphalt mix that was employed in road construction. Limestone used mainly for blast-furnace and open-hearth flux, concrete aggregate, and roadstone was quarried in the county during the year. Producers were: Dominion Limestone Division, Chemstone Corp., Shenandoah Valley Lime & Stone Corp., Strasburg Lime Division, Chemstone Corp., all of Strasburg; C. S. Mundy Quarries, Inc., Timberville; and Toms Brook Lime & Stone Co., Inc., Toms Brook.

Digitized by Google

**Smyth.**—Metallurgical manganese ore containing 35 percent or more manganese was mined in Smyth County by Manganese Mining & Contracting Co., Rural Retreat (Glade Mountain mine); and Marion Manganese Ore Co., Inc., National Manganese Co., Inc., Rural Retreat Manganese Ore Co., O. E. Sayers (Slabtown mine), Sidney Manganese Corp., and Umbarger Corp., all near Marion. Nearly 60 percent of the State production of manganese ore was mined in Smyth County. Olin Mathieson Chemical Co. recovered salt from artificial brines; the salt was processed into chlorine, soda ash, and other chemicals. The brines were obtained from underground salt beds at Saltville. Olin Mathieson Chemical Corp. also produced limestone from the Worthy mine near Saltville. Output was employed mainly for chemical use by alkali plants. Other limestone producers were E. P. Ellis Quarry and Holston River Quarry, Inc., both near Marion. Their output was used principally for concrete aggregate and roadstone. The pits of Clay S. Sayers and C. R. Snider & Sons, both of Marion, produced building sand. Appalachian Shale Products Co., Marion, produced miscellaneous clay for use in heavy clay products near its open-pit mine.

**Spotsylvania.**—The only mineral producer in Spotsylvania County was Massaponax Sand & Gravel Corp. near Fredericksburg; it produced building and paving sand and gravel.

**Surry.**—Paul Miller (Spring Grove) mined calcareous marl from an open pit near Claremont and dried, ground, and bagged it for agricultural purposes.

**Tazewell.**—Again Tazewell County ranked fourth in coal produced in Virginia and increased 37 percent in value compared with 1955. Pocahontas Fuel Co. produced the greatest quantity of coal in the county from the combined output of the Amontate, Bishop, Boissevain, and Jenkinjones mines. Other leading producers were Jewell Ridge Coal Corp., Cox & Cooper Coal Co., Alfredtown Coal Co., Fleetwood Coal Co., Nance Fork Coal Co., Shelton & Simmons Coal Co., James T. Absher, Dixon Red Ash Coal Co., Inc., Bandy Bros. Coal Co., and Albert T. Keen.

Lime for building, agricultural, and chemical uses was produced by Blue Grass Lime Co., Tazewell; and Peery Lime Co., North Tazewell. General Shale Products Corp. at its Richlands pit produced miscellaneous clay for heavy clay products. Crushed limestone used for concrete aggregate, roadstone, railroad ballast, blast-furnace flux, agricultural purposes, and as dust for coal mines was produced by Pounding Mill Quarry Corp., Pounding Mill; and Peery Lime Co., North Tazewell.

**Warren.**—Riverton Lime & Stone Co., Division of Chadbourn Gotham, Inc. (formerly Dominion Minerals Division, Riverton Lime & Stone Co.), quarried and crushed limestone for concrete aggregate, roadstone, railroad ballast, and agricultural uses. This firm also produced hydraulic lime at its 6-pot kiln plant at Riverton.

**Washington.**—Only United States Gypsum Co. mined gypsum in Virginia at Plasterco. Lambert Bros., Inc. (Bristol) quarried limestone for use as concrete aggregate and roadstone and produced a small tonnage of paving and road sand. The Colitz Mining Co., Inc., continued to produce sizable quantities of manganese ore of 35-percent or more manganese content from operations near Damascus.

465877—58——76

Digitized by Google

Beneficiation of the raw material consisted of washing and dense-medium separation.

**Westmoreland.**—Paving and road sand and gravel was produced by Brown Construction Co. (Montross).

**Wise.**—Of the 8 coal-producing counties in Virginia, Wise County ranked second and increased 34 percent in value of production over 1955. Leading coal producers were Stonega Coal & Coke Co., Clinchfield Coal Co., Coal Processing Corp., Wise Coal & Coke Co., Sunrise Coal Co., Stallard & Nicewonder Coal Co., Dale Branch Coal Co., Fleming Coal Co., Bolling Coal Co., and Lease Hollow Coal Co. Limestone for concrete aggregate and roadstone was produced near Big Stone Gap by Southwest Quarries, Inc.

**Wythe.**—Silver was recovered as a byproduct of the beneficiation of Austinville zinc-lead ores by New Jersey Zinc Co. The production of both lead and zinc increased compared with 1955, continuing at capacity. Mine development at both Austinville and Ivanhoe mines was progressing satisfactorily. The connecting tunnel between the two mines was nearly completed at the end of the year. A history of mining at Austinville, including the mining of land during the early Colonial, Revolutionary, and Civil War days, was published.[12] The discovery of zinc values and the successful application of flotation in treating zinc sulfide ores led to continued growth of mining and concentrating at this place. Limestone used for agricultural purposes, fertilizer filler, and road building, was recovered as a byproduct of zinc mining by the New Jersey Zinc Co., Austinville. Near Poplar Camp, H. D. Crowder quarried and crushed limestone for concrete aggregate and roadstone. The Town of Wytheville also quarried limestone for concrete aggregate and roadstone.

**York.**—Diamond Construction Co. produced building sand and paving gravel in the City of Hampton [13] in 1956.

---

[12] Albers, W. L., 200th Anniversary of Austinville Mine: Mineral Resources Jour., vol. 3, No. 3 September 1956, pp. 5–7.

[13] Although Hampton is an independent city, it is included in York County.

Digitized by Google

# The Mineral Industry of Washington

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the State of Washington Division of Mines and Geology.

By Kenneth D. Baber,[1] Frank B. Fulkerson,[1] Norman S. Petersen,[1] and Albert J. Kauffman, Jr.[2]

WASHINGTON'S mineral production dropped nearly $5.7 million in 1956. Metals supplied 26 percent of the total value and nonmetals and fuels 74 percent. Most of the decline was due to a decrease of $5.5 million in production of nonmetals and fuels, principally sand and gravel, cement, and coal. Production of lime and of talc and soapstone also declined. Stone output was up in 1956, as were several other commodities of smaller total value, including clays, diatomite, gypsum, olivine, and peat. In metal mining a decrease in the value of copper, gold, and zinc output was largely offset by a gain in lead production. Total value of metals declined only $200,000. Minor contributions to the State value were made by chromite, iron ore, silver, and tungsten.

**Trends and Markets.**—In the metal mining-industry construction was begun late in 1956 on a $3 million uranium-ore-processing plant in Stevens County. Completion of the plant was expected to stimulate uranium mining by providing a market for custom ore. Output of lead was second highest on record, in consequence of a development program by the leading lead producer; however, 1 of the 4 major mines producing lead and zinc was shut down indefinitely on November 21 because of difficulty in marketing zinc concentrate. It was announced also that the only large copper mine in the State was to be abandoned in 1957. Lead and zinc prices rose 6 and 10 percent, respectively. The price of lead was stabilized at 16 cents throughout 1956. The price of zinc increased ½ cent per pound to 13½ cents in January and remained at this level for the remainder of the year. Demand for lead continued strong, but the zinc market weakened in midyear, although continued purchases for the Government stockpile prevented a price decline. The market for copper was featured by a near-record high price early in the year, followed by sharp declines. The price of electrolytic refined copper, which had risen from 30 cents in January 1955 to 46 cents in early 1956, was reduced to 40 cents in July and cut further to 36 cents in October. Strikes at United States and foreign operations had brought about a price increase in 1955, and the decrease in price in 1956 was caused by greater supplies of copper from United States and foreign mines. Average weighted prices per pound of all grades of refined metal sold in 1956, as com-

[1] Commodity-industry analyst, Bureau of Mines, Region I, Albany, Oreg.
[2] Chief, Division of Mineral Industries, Bureau of Mines, Region I, Albany, Oreg.



Digitized by Google

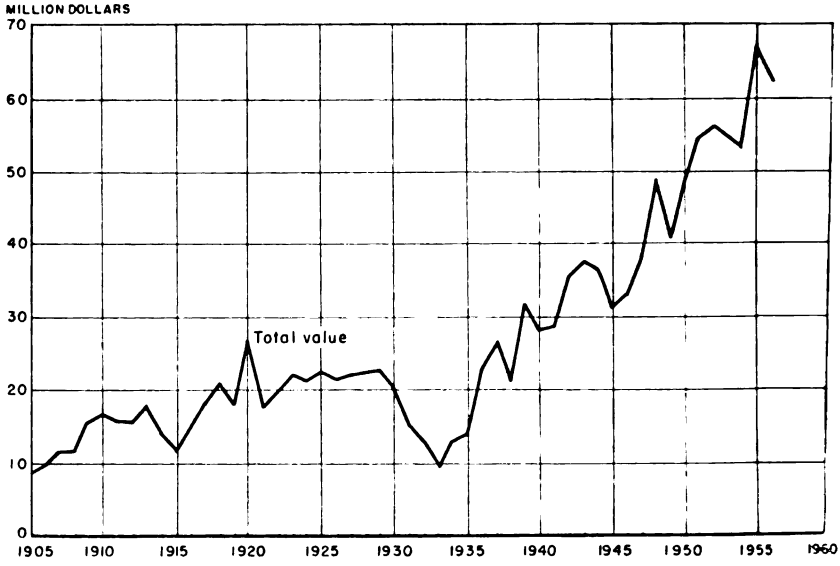



FIGURE 1.—Value of mineral production in Washington, 1905–56.

**TABLE 1.—Mineral production in Washington, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Barite | 25 | $250 | ---- | ---- |
| Clays | 365,331 | 411,807 | 319,988 | $439,461 |
| Coal | 609,790 | 4,263,030 | 472,620 | 3,432,127 |
| Copper (recoverable content of ores, etc.) | 3,958 | 2,952,668 | 2,926 | 2,487,100 |
| Chromite, gross weight | 22 | 1,706 | 30 | 3,330 |
| Epsomite | 100 | 5,000 | (2) | (2) |
| Gold (recoverable content of ores, etc.), troy ounces | 74,360 | 2,602,600 | 70,669 | 2,473,415 |
| Gypsum | 3,500 | 14,000 | (2) | (2) |
| Lead (recoverable content of ores, etc.) | 10,340 | 3,081,320 | 11,657 | 3,660,298 |
| Peat | 37,640 | 113,254 | 37,043 | 128,964 |
| Pumice | (2) | (2) | 5,291 | 14,757 |
| Sand and gravel | 21,645,161 | 19,350,682 | 16,841,792 | 15,037,128 |
| Silver (recoverable content of ores, etc.), troy ounces | 436,348 | 394,917 | 448,442 | 405,853 |
| Stone | 6,593,212 | 10,579,631 | 8,057,338 | 11,659,594 |
| Tungsten ore and concentrate 60-percent $WO_3$ basis | 12 | 45,949 | 2 | (2) |
| Zinc (recoverable content of ores, etc.) | 29,536 | 7,265,856 | 25,609 | 7,016,886 |
| Value of items that cannot be disclosed: Abrasive stone, carbon dioxide, cement, diatomite, gem stones, iron ore, lime, magnesite, olivine, strontium (1956), talc and soapstone, and values indicated by footnote 2 | ---- | 19,765,194 | ---- | 17,753,142 |
| Total Washington [3] | ---- | 67,334,000 | ---- | 61,685,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originate in Washington cannot be credited owing to lack of information (see last paragraph of introduction).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total adjusted to eliminate duplicating value of clays and stone.

Digitized by Google

pared with 1955, were as follows (1955 prices in parentheses): Copper, $0.425 ($0.373); lead, $0.157 ($0.149); and zinc, $0.137 ($0.123).

Washington was the principal Pacific Coast State in the importation and exportation of metals, due to the large imports of copper ore and concentrate and exports of refined copper handled at the Port of Tacoma. Smelting and refining of nonferrous metals was the second fastest growing manufacturing industry in Washington, ranking behind aircraft. Refined copper and aluminum were produced. In 1956 aluminum plants in the State operated with no interruptions to power supplies. Production of primary aluminum reached a new record high and owing to the growing demand the price in the United States for aluminum ingot advanced from 24.4 to 27.1 cents a pound during the year. In ferrous-metals processing a $25 million program was announced to expand the largest steelworks in the State to meet increased steel requirements in the Northwest.

In nonmetals the year was marked by expansion of cement production capacity and distribution facilities and completion of a structural glazed-tile plant. In prospect for 1957 was construction of a large plant to manufacture refractories. Production of cement, sand and gravel, and clays was down in 1956 due to a decline in construction. Employment by construction contractors averaged only 43,900, lowest since 1950. About 1,000 workers were idled in the spring by a 76-day labor-management dispute. The tieup hampered expansion in this seasonal industry. Residential building decreased. Completion of major construction at The Dalles and Chief Joseph Dam was a major factor in the employment decline. Valuation of building permits issued was $390.6 million compared with $381.0 million in 1955. This was an increase of 2 percent, but actual construction covered by the permits declined, because building costs increased by more than 2 percent. The building-permit totals covered residential, commercial, and industrial building authorized by municipalities.

It was estimated that Federal grants to the State of Washington for highway construction in 1957–70 would total $582 million. This represented 90 percent of the estimated cost of the interstate system and 50 percent of the estimated cost of other Federal-aid roads. The National Crushed Stone Association estimated that construction on the new program in Washington in 1957–59 would require mineral aggregate above normal requirements as follows: 1957, 5 million tons; 1958, 6 million tons; 1959, 7 million tons.[3]

Oil refining in the State continued to grow rapidly. Expansion was underway at 1 plant, and plans were reported for constructing 2 additional refineries. Production of coal continued to decrease sharply. Coal output has decreased continuously since 1949 owing to competition from out-of-State producers and conversion of locomotives to diesel power. Initial deliveries of natural gas from the San Juan fields of New Mexico were begun during the year.

Most important development in the chemical industry in 1956 was initiation of construction by Phillips Pacific Chemical Co. on a $20 million anhydrous ammonia plant on the Columbia River near Kennewick and Pasco. The plant was to produce 200 tons per day of ammonia for agricultural and industrial uses. The industry was

[3] Rock Products Rock Products Forecast: Vol. 60, No. 1, January 1957, pp. 78–79.

Digitized by Google

made possible by the availability of natural gas in the State. A report [4] indicated that the chemical industry in Washington was the fifth largest manufacturing industry based on employment and the sixth fastest growing. The bulk of employment was in inorganic chemicals, principally in the manufacture of fissionable materials at the Hanford atomic works. A wide variety of chemicals was produced, including alkalies and chlorine, fertilizers, explosives, and compressed and liquefied gases. The average employment in 1956 represented 5.8 percent of the total manufacturing employment compared with 4.7 percent in 1947. The average number of employer units was 156 in 1956 as compared with 130 in 1947. In contrast with lumber and wood products—the principal manufacturing industry in the State—there usually are no serious seasonal fluctuations in chemicals. The industry was concentrated in the Seattle and Tacoma metropolitan areas and in Benton County in eastern Washington. According to the report, the long-run outlook for chemicals in the State was extraordinarily good. Factors which would promote growth in chemicals included the advent of natural gas in the area; growing local markets; promise of increased hydroelectric power; and expanding industries, such as oil refining, which will make byproducts available for the manufacture of chemicals. A survey [5] disclosed that 806,600 tons of chemical raw materials was used in 1956 by Pacific Northwest pulp and paper plants. The survey listed 45 chemical raw materials, the tonnage required in 1956, and the percentage of total tonnage obtained from northwestern, western, central, eastern, and foreign sources. The entire tonnages of caustic soda (71,798 tons) and chlorine (113,959 tons) were purchased from Pacific Northwest producers, while sulfur (146,652 tons) was obtained from Wyoming (49 percent), Texas and Louisiana (46 percent), and the Pacific Northwest (5 percent).

**Inventory of Metallic Minerals.**—An inventory of all the metallic mineral occurrences known in the State was published.[6] The report contained a large amount of previously unpublished information.

**Employment and Wages.**—Mining-industry employment advanced slightly (2 percent), while payrolls increased sharply (9 percent). Expansion of employment in one segment of the industry (nonmetallic mining) explained the gain. A drop in copper-ore mining offset an advance in metal-mining contract services and miscellaneous metal mining (includes uranium). Nearly all parts of the mining industry had larger payrolls than in the preceding year; however, copper-ore mining and coal mining dropped in both employment and payrolls. Mineral-manufacturing employment and payrolls were up 6 and 10 percent, respectively. Three product groups—smelting, refining, and casting of ferrous and nonferrous metals, industrial inorganic chemicals, and petroleum and coal products—recorded increases. The remaining product group—stone, clay, and glass products—dropped in employment but reported a slightly higher wage total. Employment in mineral manufacturing was more than eight times greater than in mining.

[4] Washington Employment Security Department, The Washington Labor Market: Issue 141, July 1957, pp. 5–6.
[5] Guthrie, Frank K., Nelson, Robert J., and Wicks, Charles E., The 1956 Chemical Requirements for the Pacific Northwest Pulp and Paper Industry: Raw Materials Survey, Market Survey 4, 1957, 10 pp.
[6] Huntting, Marshal T., Inventory of Washington Minerals, Part II Metallic Minerals: Washington Division of Mines and Geology Bull. 37, vol. I—text, vol. II—Maps, 1956, 495 pp.

Digitized by Google

**TABLE 2.—Average monthly employment and total wages in mining and mineral manufacturing, 1954–56, by industry [1]**

| Industry | 1954 | | 1955 | | 1956 | |
|---|---|---|---|---|---|---|
| | Average monthly employment | Total wages | Average monthly employment | Total wages | Average monthly employment | Total wages |
| **Mining:** | | | | | | |
| Metal mining: | | | | | | |
| Copper ore | 318 | $1,607,998 | 293 | $1,601,076 | 246 | $1,433,839 |
| Lead and zinc ore | 355 | 1,704,637 | 404 | 1,991,424 | 415 | 2,349,704 |
| Gold and silver ore | 192 | 865,467 | 188 | 961,958 | 175 | 962,934 |
| Metal mining not elsewhere classified and metal-mining contract services | 41 | 139,951 | 70 | 275,788 | 135 | 596,779 |
| Bituminous coal | 677 | 2,925,159 | 608 | 2,834,807 | 513 | 2,473,431 |
| Crude petroleum and natural gas | 48 | 244,606 | 72 | 375,196 | 76 | 437,474 |
| Nonmetallic mining and quarrying: | | | | | | |
| Dimension-stone quarries | 94 | 452,286 | 74 | 355,128 | 82 | 407,869 |
| Crushed-stone quarries other than limestone | 107 | 497,725 | 109 | 517,856 | 130 | 684,295 |
| Crushed-limestone quarries | 79 | 318,242 | 100 | 432,828 | 102 | 485,822 |
| Sand and gravel quarries, pits, and dredges | 298 | 1,456,220 | 317 | 1,649,867 | 397 | 2,130,183 |
| Clays, ceramic and other refractory materials | 105 | 431,748 | 151 | 665,954 | 164 | 761,398 |
| Nonmetallic minerals not elsewhere classified | 11 | 27,892 | 14 | 41,447 | 14 | 53,693 |
| Total mining | 2,325 | 10,671,931 | 2,400 | 11,703,329 | 2,449 | 12,777,421 |
| **Mineral manufacturing:** | | | | | | |
| Stone, clay, and glass products: | | | | | | |
| Glass products | (2) | (2) | 283 | 1,396,395 | 265 | 1,439,119 |
| Cement, hydraulic | 809 | 3,569,281 | 792 | 3,562,804 | 732 | 3,611,356 |
| Structural clay products | 618 | 2,594,020 | 624 | 2,764,518 | 575 | 2,616,461 |
| Pottery and related products | 22 | 64,632 | 21 | 62,243 | 24 | 69,582 |
| Concrete, gypsum, and plaster products | 1,300 | 5,799,752 | 1,520 | 6,864,614 | 1,451 | 6,824,202 |
| Cut stone and stone products | 36 | 120,482 | 44 | 140,084 | 33 | 102,787 |
| Miscellaneous nonmetallic mineral products | 684 | 3,097,827 | 351 | 1,559,733 | 365 | 1,718,383 |
| Total stone, clay, and glass products | 3,469 | 15,245,994 | 3,635 | 16,350,391 | 3,445 | 16,381,890 |
| Smelting, refining, and casting: | | | | | | |
| Blast furnaces, steelworks, and rolling mills | 1,790 | 8,279,604 | 2,224 | 11,319,252 | 2,358 | 12,533,525 |
| Iron and steel foundries | 963 | 4,348,157 | 1,145 | 5,346,374 | 1,189 | 5,785,859 |
| Smelting and refining of nonferrous metals, except aluminum | 9,070 | 45,312,091 | 1,085 | 5,194,126 | 1,269 | 6,168,135 |
| Smelting, rolling, drawing, and alloying of aluminum | | | 8,855 | 48,142,042 | 9,792 | 56,026,585 |
| Nonferrous foundries | 212 | 1,045,555 | 266 | 1,403,570 | 259 | 1,341,178 |
| Miscellaneous primary metal industries | 148 | 704,123 | 101 | 529,818 | 122 | 671,067 |
| Total smelting, refining, and casting | 12,183 | 59,689,530 | 13,676 | 71,935,182 | 14,989 | 82,526,349 |
| Industrial inorganic chemicals | 9,131 | 53,034,755 | 9,721 | 58,049,310 | 9,910 | 60,575,884 |
| Products of petroleum and coal | 197 | 1,189,215 | 719 | 3,954,200 | 1,042 | 6,390,697 |
| Total mineral manufacturing | 24,980 | 129,159,494 | 27,751 | 150,289,083 | 29,386 | 165,874,820 |
| Total mining and mineral manufacturing | 27,305 | 139,831,425 | 30,151 | 161,992,412 | 31,835 | 178,652,241 |

[1] Washington State Employment Security Department. Data in this series are published quarterly in Employment and Payrolls in Washington State by County and by Industry—Industries Covered by the Employment Security Act. "Covered" employment in Washington applies to all services performed except agricultural labor, domestic service, Government service, railroads, and minor exceptions. There are no limitations with regard to size of firm or size of payroll.

[2] Included with miscellaneous nonmetallic mineral products.

Digitized by Google

**Power.**—Federal power projects under construction included The Dalles Dam on the Columbia River between Oregon and Washington and an addition to the powerhouse at McNary Dam on the same reach of the river. Upstream, additional generating capacity was being installed at Chief Joseph Dam. These 3 projects were to add 2.0 million kw. of installed capacity. Another Federal project—Ice Harbor Dam—was underway on the Snake River and was to create 270,000 kw. of capacity. Nonfederal agencies had 6 hydroelectric projects under construction, which will add 1.2 million kw. to State power capacity; also, these agencies held licenses from the Federal Power Commission for construction of 2 additional hydroelectric installations with capability of 1.3 million kw.[7]

The Grant County Public Utility District began constructing the Priest Rapids Dam and a 640,000-kw. generating plant on the Columbia River. This public utility district also held a Federal license for the Wanupum Dam, above Priest Rapids, which would generate 570,000 kw. Construction had not begun at the end of 1956. Farther north on the Columbia River, the Chelan County Public Utility District planned to begin construction early in 1957 on the 711,000-kw. Rocky Reach Dam and powerplant.

In western Washington the Pacific Power & Light Co. was constructing a $44-million hydroelectric development on the Lewis River known as the Swift project, which would produce 256,000 kw. Excavation in the bed of the river was underway, and the diversion tunnel was driven. Owing to the new storage at the Swift project, a third generator to produce 50,000 kw. was to be installed at the company Merwin Dam downstream on the Lewis River.

The city of Tacoma initiated construction on a 160,000-kw. development at the Mayfield Dam on the Cowlitz River. The Seattle Light Department was adding 137,000 kw. by increasing storage at the Gorge and Ross sites on the Skagit River. The Puget Sound Power & Light Co. was to install additional generating capacity at two points on the Baker River. The company also was adding another generator at its Snoqualmie No. 2 location on the Snoqualmie River.

**Defense Minerals Exploration Administration.**—During 1956 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial participation by the Government was repayable from royalties on ore discovered and subsequently mined.

**Mineral Values Not Included.**—In addition to the mineral values credited to Washington in table 1, some are omitted owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, selenium, tellurium, gallium, and germanium. The quantities sometimes are not known and sometimes (though known by analyses) are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues obtained from refining such metals as copper and lead and those obtained in other ways. It is not possible in many such instances to allocate the mineral pro-

[7] Seattle-First National Bank, Quarterly Review: February 1957, 8 pp.

Digitized by Google

TABLE 3.—Defense Minerals Exploration Administration contracts active during 1956

| County and contractor | Property | Commodity | Contract | | |
|---|---|---|---|---|---|
| | | | Date | Total amount | Government participation, percent |
| CHELAN | | | | | |
| Howe Sound Co | Holden | Copper | Dec. 7, 1953 | $363,840 | 50 |
| CLALLAM | | | | | |
| Peacock and Peacock | Crescent | Manganese | Mar. 23, 1955 | 31,000 | 75 |
| PEND OREILLE | | | | | |
| LaSota-Jones Lead & Zinc Corp. | LaSota-Jones | Lead-zinc | Aug. 13, 1956 | 11,310 | 50 |
| SKAGIT | | | | | |
| Twin Sisters Magnesium & Chrome Corp. | Alamether, Begonia and Shaft. | Chromium | May 26, 1955 | 24,175 | 50 |
| SNOHOMISH | | | | | |
| Robert T. Curtiss | Mint claims | Copper | Oct. 7, 1952 | 17,600 | 50 |
| SPOKANE | | | | | |
| Affiliated Mines, Inc | Sprague lease | Uranium | May 18, 1956 | 9,460 | 75 |
| STEVENS | | | | | |
| Grandview Mines (assignee of Scandia Mining Group). | Scandia | Zinc | Aug. 15, 1952 | 29,260 | 50 |
| Northwest Uranium Mines, Inc. | Peters and Boyd permits. | Uranium | June 15, 1956 | 29,160 | 75 |
| Pacific Northwest Mining Co. | Lucile | Lead-zinc | Dec. 14, 1951 | 29,210 | 50 |

ducts to States of origin, and sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral commodity of value, the production of which usually cannot be separated as to source, is byproduct sulfuric acid.

## REVIEW BY MINERAL COMMODITIES

### METALS

**Aluminum.**—Production of primary aluminum continued to increase to record totals. Output in 1956 was 486,204 short tons, with a value of $233,632,126, compared with 452,874 short tons and $197,836,809 in 1955. Contributing to the total were reduction plants at Vancouver and Wenatchee (Aluminum Company of America), Spokane and Tacoma (Kaiser Aluminum & Chemical Corp.), and Longview (Reynolds Metals Co.). New capacity was added, and there were no production losses because of interruptions to power supplies. Kaiser Aluminum & Chemical Corp. planned to build an aluminum-reduction plant in Douglas County by 1961.[8] The project was contingent on construction of the proposed Wells Dam by the Douglas County Public Utility District. The Kaiser plant would require 150,000 kw. for its three potlines. The Wells Dam ultimately would supply 483,000 kw. Estimated cost of the dam was $110 million.

[8] E&MJ Metal and Mineral Markets, vol. 27, No. 46, Nov. 15, 1956, p. 3.

Digitized by Google

A report [9] on development of the Pacific Northwest aluminum industry (Washington, Oregon, and Montana) provided data on production, plant capacities, and employment. In a subsequent newsletter,[10] employment in the primary-aluminum industry in 1956 in this area was shown as 11,400, with wages totaling $63.9 million. About 46 percent of the aluminum output was processed by the producing companies into finished and semifinished forms, such as sheet rod, wire, cable, and extrusions. The value of electric power purchased was $22.8 million, and purchases of materials, supplies, and services totaled $32.9 million.

In 1956 reduction capacity at the Alcoa Vancouver plant was increased 2,000 tons per year, bringing the installed capacity to 97,500 tons. Construction contracts with a value of $500,000 were let for three office and shop buildings. The largest project in the contract was for a two-story extension to the main office building. On August 14 a new 3-year wage agreement was signed between Alcoa and the Aluminum Trades Council of Vancouver, providing wage increases for 1,350 employees and extending other benefits.

A 3-year contract including virtually the same terms also was signed at Wenatchee during August. At the Wenatchee works new potline equipment in a $2 million expansion program went into operation in March. This project had begun in September 1955 and involved installation of additional pots in each of the plant's 4 potlines to increase installed capacity to 108,500 tons annually.

Alcoa indicated that the annual payroll at its Wenatchee and Vancouver works reached an alltime high of $14.7 million. Another $7 million was spent for purchases of materials and supplies in the Vancouver and Wenatchee areas, and expenditures for transportation amounted to more than $11 million. Electricity expenses exceeded $7 million, and State and local taxes totaled nearly $2 million. During 1956 contracts were signed for delivery of natural gas on an interruptible basis to the Vancouver and Wenatchee plants for use in producing steam heat, in baking carbon electrodes, and in heating remelt furnaces. The Wenatchee plant contracted for 1.2 million cubic feet of gas daily on a 5-year basis directly from the Pacific Northwest Pipeline Corp. At Vancouver, 35,000 therms per day were contracted for on a 5-year basis from the Portland Gas & Coke Co. Both the Vancouver and Wenatchee plants were to maintain standby heating equipment employing other fuels, for use when gas supplies were interruptible, particularly during cold weather.

The program of Kaiser Aluminum & Chemical Corp. in 1956 involved modernizing and improving the efficiency of its operations. Facilities included reduction plants at Tacoma and Mead (near Spokane), an aluminum-rolling mill at Trentwood in the Spokane area, and the company department of metallurgical research at Spokane. The total payroll during 1956 was $37.7 million. Purchases of materials, supplies, and services in the Pacific Northwest totaled $29.5 million, which included $8.5 million for electric power. Above-average stream flows, augmented by release of water from Hungry Horse Dam at crucial periods according to terms of a provisional power contract

[9] Sterrett, Chester K., Aluminum Fabrication in the Pacific Northwest: Raw Materials Survey Inf. Circ. 10, August 1956, 5 pp.
[10] Raw Materials Survey Newsletter, Issue 1, Series 57, Mar. 29, 1957.

Digitized by Google

with Bonneville Power Administration (BPA), permitted full production during 1956. Some high-cost, steam-generated power was purchased in October and December to supplement hydropower sources. Nearly half of the company aluminum-smelting operations at Mead and Tacoma depended on interruptible electric power.

Production capacity at the Tacoma reduction works was increased 5,300 tons in 1956 by the addition of 18 new reduction cells to bring the rated capacity to 38,500 tons of primary aluminum a year. The new cells, designed to operate on 100,000 amperes, were twice the size of the conventional cells at the plant. Plans for improving working conditions and operating efficiency at Tacoma were underway and included modification of the paste plant, which produced the carbon paste used in the reduction-cell anodes. Other planned work included a complete new lighting system in the potrooms.

Production capacity of the Mead plant was increased to 176,000 tons of primary aluminum annually by the addition of 16 new reduction cells. The project, costing $300,000, added 1,000 tons to annual capacity.

A new rolling-ingot casting station also was completed to supplement the ingot produced by the remelt facilities at the Trentwood rolling mill. Production of aluminum sheet and plate at the Trentwood plant increased to a new high. Rated capacity was 396 million pounds annually. Two new products—cross-corrugated roofing sheet and shade screen up to 48 inches wide—were added to the commodities made at Trentwood. Major improvements included increasing the capacity of the heavy-plate stretcher to 10 million pounds per square inch pull to produce bigger stress-relieved stretched airframe stock and addition of heavy-plate sonic-test equipment. A new gold-colored aluminum alloy was developed in the department of metallurgical research, and a new connector for joining aluminum and copper in electrical connections was perfected.

The Mead and Trentwood plants converted from oil to natural gas. These plants, the largest Spokane-area industrial consumers of gas, contracted for daily maximums of 10 million cubic feet at the Trentwood rolling mill and 2.8 million cubic feet at the Mead smelter. The gas replaced oil formerly used for heat energy. The amount of electricity required in reducing primary aluminum was not affected by the use of natural gas. At the Trentwood plant natural gas replaced fuel oil in 7 production and maintenance areas in the 525-acre plant site. Other planned uses included generation of inert gas for use in aluminum-annealing furnaces. Over 10,000 feet of main feeder pipe ranging in size from 1¼ inches to 10 in diameter, were installed at Trentwood to serve the boilerhouse heating plant, remelt furnaces, reclamation furnaces, machine shop, and other facilities. The total cost of the conversion at Trentwood was one-third million dollars. At the Mead plant gas was utilized in three areas. Major uses were in the rolling-ingot casting furnaces and in production of the carbon-anode blocks used in the reduction process.

**Chromium.**—A small tonnage of chromite ore was shipped from the Cypress Island mine, Skagit County, to the Government (GSA) Grants Pass (Oreg.) Purchase Depot.

**Copper.**—Plans for closing the Holden mine, Chelan County, Washington's only large copper producer, were disclosed in the Howe

Digitized by Google

Sound Co. 1956 annual report to shareholders. The operation was to be shut down in June 1957, but it was estimated that complete closing would take 1½ to 2 years. Owing to increased costs, the operation was marginal in recent years, except in periods of high copper prices. The Holden mine was acquired by Howe Sound Co. in 1929, and development during the next 25 years at a cost of more than $3 million included construction of the town of Holden and of a 2,000-ton concentrator. Average employment in 1956 was between 200 and 225 men; and the town, which included 20 company-owned residences

**TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals**

| Month | Gold (fine ounces) | Silver (fine ounces) | Copper (short tons) | Lead (short tons) | Zinc (short tons) |
|---|---|---|---|---|---|
| January | 5,770 | 35,670 | 273 | 1,034 | 1,975 |
| February | 6,320 | 51,860 | 296 | 1,023 | 2,089 |
| March | 5,040 | 35,440 | 251 | 877 | 2,001 |
| April | 6,020 | 46,050 | 224 | 840 | 1,900 |
| May | 6,060 | 40,430 | 239 | 778 | 2,074 |
| June | 5,590 | 32,470 | 218 | 862 | 1,976 |
| July | 5,720 | 30,750 | 275 | 1,098 | 2,238 |
| August | 7,195 | 42,800 | 300 | 1,265 | 2,344 |
| September | 5,805 | 42,570 | 241 | 1,106 | 2,166 |
| October | 6,490 | 26,781 | 246 | 911 | 2,166 |
| November | 5,473 | 37,005 | 195 | 854 | 2,179 |
| December | 5,186 | 26,616 | 168 | 1,009 | 2,501 |
| Total | 70,669 | 448,442 | 2,926 | 11,657 | 25,609 |

**TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total 1860–1956, in terms of recoverable metals [1]**

| Year | Mines producing [2] | | Material sold or treated [3] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value |
| 1947–51 (average) | 28 | 3 | 1,049,344 | 67,311 | $2,355,892 | 345,205 | $312,425 |
| 1952 | 28 | 1 | 1,402,472 | 54,776 | 1,917,160 | 315,645 | 285,675 |
| 1953 | 33 | 2 | 1,706,410 | 62,560 | 2,189,600 | 321,202 | 290,704 |
| 1954 | 24 | 6 | 1,552,141 | 66,740 | 2,335,900 | 313,735 | 283,946 |
| 1955 | 16 | 1 | 1,712,113 | 74,360 | 2,602,600 | 436,348 | 394,917 |
| 1956 | 34 | 1 | 1,697,099 | 70,669 | 2,473,415 | 448,442 | 405,863 |
| 1860–1956 | | | [4] | 2,844,331 | 78,306,908 | 16,391,269 | 12,332,742 |

| Year | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 4,465 | $1,912,110 | 7,452 | $2,337,732 | 14,035 | $4,038,162 | $10,956,321 |
| 1952 | 4,357 | 2,108,788 | 11,744 | 3,781,568 | 20,102 | 6,673,864 | 14,767,055 |
| 1953 | 3,740 | 2,146,760 | 11,064 | 2,898,768 | 32,786 | 7,540,780 | 15,066,612 |
| 1954 | 3,636 | 2,145,240 | 9,938 | 2,723,012 | 22,304 | 4,817,664 | 12,305,762 |
| 1955 | 3,958 | 2,952,668 | 10,340 | 3,081,320 | 29,536 | 7,265,856 | 16,297,361 |
| 1956 | 2,926 | 2,487,100 | 11,657 | 3,660,298 | 25,609 | 7,016,866 | 16,043,542 |
| 1860–1956 | 119,869 | 42,101,613 | 167,765 | 37,980,652 | 338,326 | 75,884,490 | 246,606,405 |

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] 1860–1903: Figure not available; 1904–56, 25,842,327 tons produced.

Digitized by Google

and approximately 100 private homes, had a population of 450. In addition to copper, the mine produced substantial quantities of gold, silver, and zinc. In 1955 and part of 1956 extensive work in areas of the mine not previously explored was carried out under the DMEA program.

**TABLE 6.—Gold produced at placer mines, 1947–51 (average) and 1952–56, by methods of recovery**

| Method | Mines producing | Material treated (cubic yards) | Gold recovered | | |
|---|---|---|---|---|---|
| | | | Fine ounces | Value | |
| | | | | Total | Average per cubic yard |
| Nonfloating washing plants: [1] | | | | | |
| 1947–51 (average) | 1 | 4,140 | 22 | $770 | $0.186 |
| 1952 | | | | | |
| 1953 | 2 | 550 | 28 | 980 | 1.782 |
| 1954 | 4 | 3,400 | 106 | 3,710 | 1.091 |
| 1955 | 1 | 100 | 3 | 105 | 1.050 |
| 1956 | | | | | |
| Small-scale hand methods: | | | | | |
| 1947–51 (average) | 2 | 367 | 5 | 175 | .477 |
| 1952 | 1 | 60 | 3 | 105 | 1.750 |
| 1953 | [2] | [2] | 1 | 35 | |
| 1954 | 2 | 1,150 | 12 | 420 | .365 |
| 1955 | | | | | |
| 1956 | 1 | 360 | 6 | 210 | .583 |
| Grand total placers: | | | | | |
| 1947–51 (average) [4] | 3 | 5,907 | 33 | 1,141 | .228 |
| 1952 | 1 | 60 | 3 | 105 | 1.750 |
| 1953 | 2 | [3] 550 | 29 | 1,015 | [3] 1.782 |
| 1954 | 6 | 4,550 | 118 | 4,130 | .908 |
| 1955 | 1 | 100 | 3 | 105 | 1.050 |
| 1956 | 1 | 360 | 6 | 210 | .583 |

[1] Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."
[2] From property not classed as a mine.
[3] Figure not available.
[4] Includes 14 ounces of gold from dragline dredges.
[5] Excludes small-scale hand methods.

Production from other copper mines in Washington continued at about the same rate as in 1956. In King County Western States Copper & Uranium Corp. leased the Rainey property 16 miles northeast of North Bend to H & R Corp. of Everett. The mine was equipped with a 50-ton-per-day ore-concentrating plant and was a small producer of copper in 1952–56. In Snohomish County small quantities of copper ore were shipped from three mines by April Mines, Inc., Broken Ridge Mining Co., and Rosaia Mining Co.; and Kromona Mines Corp. continued development and production at the Kromona copper-tungsten property. The Bonanza Lead Co. was the only producer of copper ore in Stevens County; production was from the Copper Mountain property in the Chewelah district. Lead-zinc ores mined in the State yielded small quantities of copper.

A Ferry County exploration project at the Lone Star mine was carried out by Granore Co., United States subsidiary of Granby Consolidated Mining, Smelting & Power Co., Ltd., of Copper Mountain, British Columbia. The Lone Star mine (in the extreme northern part of the county near the Canadian boundary) was first developed in 1897 by the Reservation Mining & Milling Co. In 1907 the prop-

Digitized by Google

**TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals**

| County | Mines producing | | Gold (lode and placer) [1] | | Silver (lode and placer) | |
|---|---|---|---|---|---|---|
| | Lode | Placer | Fine ounces | Value | Fine ounces | Value |
| Chelan | 3 | | 38,522 | $1,348,270 | 78,355 | $70,915 |
| King | 1 | | 58 | 2,030 | 2,048 | 1,854 |
| Kittitas | 3 | | 101 | 3,535 | 309 | 280 |
| Okanogan | 2 | 1 | 8 | 280 | 11,501 | 10,409 |
| Pend Oreille | 6 | | 2 | 70 | 29,373 | 26,584 |
| Snohomish | 4 | | 110 | 3,850 | 263 | 238 |
| Stevens | 12 | | 133 | 4,655 | 22,303 | 20,185 |
| Undistributed [2] | 3 | | 31,735 | 1,110,725 | 304,290 | 275,398 |
| Total | 34 | 1 | 70,669 | 2,473,415 | 448,442 | 405,863 |

| County | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value | |
| Chelan | 2,630 | $2,235,500 | 3 | $942 | 297 | $81,378 | $3,737,005 |
| King | 37 | 31,450 | | | | | 35,334 |
| Kittitas | | | | | | | 3,515 |
| Okanogan | 4 | 3,400 | 129 | 40,506 | 63 | 17,262 | 71,557 |
| Pend Oreille | 26 | 22,100 | 9,440 | 2,964,160 | 12,524 | 3,431,576 | 6,444,490 |
| Snohomish | 12 | 10,200 | | | | | 14,288 |
| Stevens | 215 | 182,750 | 2,085 | 654,690 | 12,725 | 3,486,650 | 4,348,930 |
| Undistributed [2] | 2 | 1,700 | | | | | 1,387,823 |
| Total | 2,926 | 2,487,100 | 11,657 | 3,660,298 | 25,609 | 7,016,866 | 16,043,542 |

[1] Source of gold: 70,663 ounces from lode mines and 6 ounces from placers.
[2] Includes values and quantities that cannot be shown separately for Ferry, Lincoln, and Pierce Counties.

**TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source material, in terms of recoverable metals**

| Source | Number of mines | Material sold or treated (short tons) | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|---|---|
| Lode ore: | | | | | | | |
| Dry gold | 6 | 124,748 | 56,894 | 332,037 | 4,000 | | |
| Dry gold-silver | 1 | 27 | 2 | 257 | | | |
| Dry silver | 2 | 8 | | 24 | | | |
| Copper | 8 | 318,306 | 13,752 | 53,100 | 5,768,000 | 6,000 | 594,000 |
| Lead | 6 | 447 | | 259 | | 552,300 | 4,400 |
| Lead-zinc | 11 | 1,253,563 | 15 | 62,764 | 80,000 | 22,755,700 | 50,619,600 |
| Total "lode material" | 34 | 1,697,099 | 70,663 | 448,441 | 5,852,000 | 23,314,000 | 51,218,000 |
| Gravel (placer operations) | 1 | (1) | 6 | 1 | | | |
| Total, all sources | 35 | 1,697,099 | 70,669 | 448,442 | 5,852,000 | 23,314,000 | 51,218,000 |

[1] 360 cubic yards.

erty was acquired by the British Columbia Copper Co., Ltd. From 1912 to 1918 this firm explored the property further by 2,220 feet of drifts, shafts, winzes, and raises and by 3,590 feet of diamond drilling. The mine was shut down at the close of World War I and remained idle, except for some minor rehabilitation and underground diamond drilling. Mineralization consisted of pyrite, chalcopyrite, and minor amounts of gold in veinlets and disseminations in a silicified zone 10 to 50 feet wide, adjacent to a sheared dacite-basalt contact. Accord-

Digitized by Google

**TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by types of material processed and methods of recovery, in terms of recoverable metals**

| Type of material processed and method of recovery | Gold (fine ounces) | Silver (fine ounces) | Copper (pounds) | Lead (pounds) | Zinc (pounds) |
|---|---|---|---|---|---|
| Lode: | | | | | |
| Amalgamation | 93 | 46 | | | |
| Cyanidation | 5,819 | 84,956 | | | |
| Concentration and smelting of concentrates | 39,607 | 334,116 | 5,839,600 | 22,764,600 | 51,213,000 |
| Direct smelting | 25,144 | 29,323 | 12,400 | 549,400 | 5,000 |
| Total lode | 70,663 | 448,441 | 5,852,000 | 23,314,000 | 51,218,000 |
| Placer | 6 | 1 | | | |
| Grand total | 70,669 | 448,442 | 5,852,000 | 23,314,000 | 51,218,000 |

ing to a news report,[11] diamond drilling by Granore Co. delineated approximately 400,000 tons of 1-percent copper ore feasible for open-pit operations and about 200,000 tons of higher grade ore suitable for underground mining.

Exploration by Bear Creek Mining Co., a subsidiary of Kennecott Copper Corp., was resumed in the summer at the Glacier Peak property high in the rugged Cascade Mountains of Snohomish County. Preliminary examinations were initiated in 1953. The firm had a purchase option on the property from Glacier Peak Mining & Smelting Co. The magnitude of the deposits was uncertain, but results were encouraging enough to warrant continuation of the work. A bulletin[12] stated:

> The main ore body is at least 600 feet by 350 feet in cross section and 400 feet deep and the second ore body is thought to be similar but smaller. It is egg shaped in cross section and is known to extend to a 500-foot depth, but the lower boundary is not known.

The helicopter airlift originating in the spring of 1955 proved successful. Loads weighing a maximum of 412 pounds were flown 19 miles to unloading areas 5,400 to 6,500 feet in elevation; a maximum of 5,280 pounds was transported in 1 day.

**Ferroalloys.**—Production of ferroalloys continued at three plants operated by Keokuk Electro-Metals Co., Ohio Ferro-Alloys Corp., and Pacific Northwest Alloys, Inc., in Douglas County, Pierce County, and Spokane County, respectively.

**Gold.**—Knob Hill Mines, Inc., near Republic in Ferry County was the leading producer of gold in the State. Production from the Knob Hill mine was increased substantially over 1955. Ore was processed in a 400-ton flotation-cyanidation plant. Conversion was made from overhand cut-and-fill stoping (using conventional stope-hammers), to horizontal cut-and-fill stoping (using airleg drills). A 1,500 cubic-foot mine compressor was installed.

The Gold King property of Lovitt Mining Co., Inc., near Wenatchee, Chelan County, was also a major producer of gold. Ore was shipped crude to a smelter. Most of the remainder of the State gold was produced as a byproduct from the Holden copper mine (Chelan

[11] Mining World, vol. 18, No. 7, June 1956, p. 110.
[12] Work cited in footnote 6, p. 84.

Digitized by Google

County). It was announced that the Holden mine would be closed in the summer of 1957 (see Copper). Production was reported from the Anna May and Ace-of-Diamonds mines, both in Swauk district of Kittitas County, and base-metal ores produced from several mines yielded small quantities of gold.

**Lead.**—Lead production increased 13 percent and totaled 11,657 tons—a quantity second only to that in 1952. Greater production from the Pend Oreille mine accounted for the increase. A total of 17 mines yielded lead and lead-zinc ores compared with only 7 in 1955; however, 1 of the largest lead mines in the State, the Goldfield Consolidated Mines Co. Deep Creek mine (Stevens County), was closed indefinitely on November 21. The company stated in its annual report to stockholders that ore from working levels was exhausted. In view of the current lead-zinc prices, high operating costs, and the difficulties experienced in marketing zinc concentrate, it was decided that sinking the shaft to develop ore at depth was not warranted. The Deep Creek venture was begun in 1947 under a $300,000 purchase contract. After that time production brought sales of $6.1 million with a total profit of about $1.8 million before depreciation, depletion, and income taxes.

A substantial increase in lead production was made at the Pend Oreille mine of Pend Oreille Mines & Metals Co., the leading Washington lead producer. During 1956 the mine and mill were operated 6 and 7 days a week, respectively, compared with 5 and 6 days in 1955. Substantial wage increases were granted to all employees, retroactive to July 1, 1956, in a new collective-bargaining agreement reached December 21. Marked improvement in the underground manpower situation permitted a greatly increased development program to be undertaken. This program had been hampered by a shortage of underground workers. A total of $530,000 was expended for development in the year, including 7,280 feet of drifts and raises, 2,170 feet of inclined shaft, 411,700 cubic feet of station work, and 30,800 feet of diamond and rotary drilling. Pend Oreille Mines & Metals Co. acquired land along both sides of the Pend Oreille River upstream from the Z-Canyon power site. This area, withdrawn in earlier years for waterpower purposes, had been reopened to mineral entry by the Congress.

Production from the Grandview mine, operated by the American Zinc, Lead & Smelting Co., continued at the same rate as in 1955. An exploration program in progress was expected to increase mine output. The leased Lead Hill mine was operated by the same firm for 2 months.

In Stevens County the American Smelting and Refining Co. Van Stone mine, predominantly a zinc producer, also supplied a substantial tonnage of lead. The Pend Oreille, Grandview, and Van Stone mines produced 92 percent of the State lead.

Low lead and zinc prices discouraged exploration activity; however, A. G. Lotze, lessee of the Gladstone group, reported discovery of a new chimney of high-grade sulfide ore. One 12-ton shipment averaged 81.1 percent lead, gross content. Ore shipments during the year totaled 393 tons, with gross content averaging 79 percent lead. A new shaft 80 feet deep, was sunk. Other lead-producing mines in Stevens County were the Goldfield Consolidated Mines Co. Lead

Digitized by Google

Trust and Sierra Zinc mines, Pacific Northwest Mining Co. Lucille mine, and A. C. Neiman Red Top mine. In Okanogan County the Peacock mine (near Conconully) was the only lead-zinc producer. The property was worked from April to November. Ore was processed in a leased mill at Omak.

**Silver.**—Silver production totaled 448,400 ounces compared with 436,300 in 1955; it was recovered entirely as a byproduct. The Knob Hill gold mine in Ferry County continued to be the leading producer. Other comparatively large producers were the Holden mine (copper ore) and the Gold King mine (gold ore), Chelan County; and the Pend Oreille property (lead-zinc ore), Pend Oreille County. Also contributing to the State total were the Peacock mine (lead-zinc ore), Okanogan County; Grandview mine (lead-zinc ore), Pend Oreille County; and the Deep Creek mine (lead-zinc ore) and the Van Stone mine (zinc ore), Stevens County.

**Steel.**—An expansion and modernization program to increase the steelmaking capacity of its Seattle plant 70 percent was announced by Bethlehem Pacific Coast Steel Corp. in December. The project was to be completed in 2½ to 3 years at a cost of approximately $25 million. Construction was to begin early in 1957. The new facilities were to include two 100-ton electric furnaces, which would be the largest electric steelmaking furnaces in the 11 Western States. The capacity of the electric furnaces was to be 420,000 net tons of ingot annually compared with the present capacity of 246,000 net tons from 5 open-hearth furnaces. Electric power needed to operate the furnaces would be approximately equal to the consumption of a city of 50,000.

Other planned facilities included soaking pits to heat the ingots before rolling and a 32-inch blooming mill to produce blooms, billets, and slabs from ingots. These facilities would permit adoption of standard-size ingots and standard practice in pouring, rolling, and preparation of the steel. A new barmill was to be constructed to replace the 12-inch barmill and produce a wider variety and greater tonnage of bars and light structural shapes. A new universal plate mill stand was to be added to the 22-inch rolling mill to produce wider, longer, thicker plates. The first step in the construction program was to be installation of the electric furnaces. The open-hearth furnaces were to be dismantled, and the area used for construction of the new blooming mill and soaking pits. It was expected that the plant would be kept in nearly full production while the expansion program was underway.

At the Isaacson Iron Works, a steel processing and fabricating plant also in Seattle, 2 bays for steel receiving and storage in the structural steel division were added; and another bay measuring 280 by 133 feet was under construction. Scrap steel was melted in two electric furnaces having an annual capacity of 100,000 tons. Carbon alloy and stainless steels were produced and used for ingots, billets, structural steel, and a variety of other industrial steels.

**Tungsten.**—Addy Development Co. (Stevens County) and Kelly Camp Tungsten Co. (Ferry County) made small shipments of tungsten concentrate.

**Uranium.**—Construction of a $3 million uranium-processing plant at Ford (Stevens County), about 40 miles northwest of Spokane, was begun by Dawn Mining Co. in October. The location was on the

465877—58——77

Digitized by Google

eastern border of the Spokane Indian Reservation, which contained the Midnite mine—site of the original discovery of uranium ore in the State—as well as several other properties. Mill capacity of 400 tons per day would enable mining out the known Midnite ore reserve during the term of the Atomic Energy Commission (AEC) concentrate purchase contract, which was to expire March 31, 1962. Provision was made for treating up to 100 tons per day of custom ore meeting grade requirements of 0.20 percent $U_3O_8$ or better. The plant was to use a column ion-exchange process, utilizing acid leaching and countercurrent decantation thickening, followed by uranium recovery in ion-exchange columns. This process was investigated by the National Lead Co. and the Bureau of Mines under sponsorship of the AEC.

Dawn Mining Co. began developing deposits adjacent to the producing Midnite mine. A stripping contract was awarded to Isbell Construction Co. to remove 231,000 tons of waste from the deposits (known as Boyd's leases), which were obtained in 1956. Diamond drilling in 1955 indicated that the property contained a continuation of the Midnite ore body. Daybreak Uranium, Inc., operated the Daybreak mine (Dahl lease) and new operations on the adjoining Huffman and Kit Carson tracts in the Mount Spokane area (Spokane County). The Lowley and Blair leases on the Spokane Indian Reservation also were acquired. Dahl Uranium Mines, Inc., and Big Smoke Uranium, Inc., also were reported to have shipped ore in 1956. Northwest Uranium Mines, Inc., began a DMEA project at holdings a few miles south of the Midnite property.

Exploration of uranium prospects declined in the latter half of 1956, owing to lack of a nearby custom mill. Activity was expected to increase after completion of the new processing plant at Ford. The AEC discontinued in 1955 the practice of entering into "off-the-plateau" purchase contracts, under which uranium producers were reimbursed for freight charges if their shipments averaged 0.20 percent uranium oxide or more. Such producers were to receive only the haulage allowance of 6 cents per ton-mile, up to 100 miles, that producers on the Colorado Plateau received.

**Zinc.**—Production of zinc was down 13 percent compared with 1955. Four mines continued to supply most of the output. One was mainly a zinc producer, and the other three were lead-zinc properties. The drop in production was due to a decline in output from the Van Stone zinc mine and closing of the Deep Creek mine. Output from the Grandview mine was greater than in the previous year, while production from the Pend Oreille property was slightly under 1955. The 4 mines produced 98 percent of all Washington zinc in 1956 (see also Lead).

## NONMETALS

**Abrasive Materials.**—Grinding pebbles produced near Chewelah (Stevens County) by Mineral Products Co. were used for tube-mill grinding by Manufacturers Mineral Co. (Seattle). The former company also crushed sandstone for abrasive purposes. Silicon carbide, used both as an abrasive and refractory, was made by the Carborundum Co. (Vancouver, Clark County), from silica mined in Oregon.

**Barite.**—No barite was reported produced in Washington during 1956.

Digitized by Google

**Cement.**—Production and shipments of cement decreased about 11 and 17 percent, respectively, compared with 1955. Year-end stocks were slightly higher than at the close of the last year. A slowdown in construction of dwellings and commercial structures figured prominently in the slackened demand for cement. Companies producing portland cement reported a price increase in line with the upward national trend. Average price for cement shipped by Washington and Oregon producers was about 25 cents a barrel above the 1955 average. This price advance was offset by higher wages, fuel-oil costs, and freight rates.

Superior Portland Cement, Inc., plants at Concrete (Skagit County) and Seattle (King County) continued to lead in cement output. Also active were Olympic Portland Cement Co., Ltd., Bellingham, Whatcom County; Ideal Cement Co., Irvin, Spokane County; Lehigh Portland Cement Co., Metaline Falls, Pend Oreille County; and Northwestern Portland Cement Co., Grotto, King County. A distributing plant on Harbor Island (Seattle) was completed by Olympic Portland Cement Co., Ltd. Cement shipped by barge from the company Bellingham plant was packed for transshipment to major areas outside of Seattle. At the Bellingham plant construction to double the output capacity was under way. Construction also was begun by the Lehigh Portland Cement Co. at its Metaline Falls plant. Improvements and additions to the packaging and loading facilities were planned.

Permanente Cement Co. established a distributing plant at Pasco to serve eastern Washington and adjacent areas in Oregon with cement. The product was moved by truck, ship, and barge from the Permanente plant at San Jose (Calif.) to Pasco.

Cement shipments continued from plants in western Washington to Alaska and several foreign countries and from eastern Washington sources to as far as Illinois.

Several Washington cement plants were described.[13]

**Clays.**—Compared with 1955 total clays output declined 12 percent in quantity and increased 7 percent in value. This advance in value was brought about by the higher prices per ton reported for fire clay and miscellaneous clay.

Of the 8 producing counties, King and Spokane ranked first and second, respectively, and supplied 46 percent of the total clays output. Other producing counties (in order of output) were Pierce, Stevens, Snohomish, Lewis, Yakima, and Clark.

Fire clay used in firebrick and other refractory products was produced in King, Spokane, and Stevens Counties. Heavy clay products were made with clay mined at 13 pits: 5 in King County, 2 in Clark County, and 1 each in Spokane, Pierce, Stevens, Snohomish, Lewis, and Yakima Counties. Bentonite for lining irrigation canals was produced near Naches (Yakima County) by Calco Industrial Minerals.

Face and common brick, partition tile, and drain tile were manufactured at 4 plants in King County, 2 in Spokane and Clark Counties, and 1 each in Lewis, Pierce, Stevens, and Yakima Counties. Firebrick and other refractory products were made at 2 plants in Spokane

[13] Lenhart, W. B., Industry Booming on Pacific Coast: Rock Products, vol. 59, No. 8, August 1956, pp. 144–152 and 220–224.



Digitized by Google

County and at 1 in King County. A flowerpot plant also was active in King County.

Gladding, McBean & Co. announced plans for constructing a new refractory-products plant at Mica (Spokane County) to make firebrick in super-, high-, intermediate-, and low-duty grades. Consumption of one-half million cubic feet of natural gas daily to fire the kilns was expected. In July the Washington Brick & Lime Co. completed its new structural glazed-tile plant at Dishman (Spokane County). This facility was the only one in the Pacific Northwest making glazed-tile products.

The ceramic-industry development and raw-material resources of Washington were discussed in a report.[14]

**Diatomite.**—Production of diatomite at the two active operations in the State was 25 percent greater in quantity and 22 percent higher in value than in 1955. Kenite Corp. continued to mine and process diatomite at its facility near Quincy (Grant County). Plant improvements during the year included installation of dry dust collectors and additional packaging equipment. The other producing company—Western Ventures, Inc.—operated the Squaw Creek deposit near Ellensburg (Kittitas County).

Diatomite was marketed for filtration, insulation, filler, and other purposes.

**Gem Stones.**—Agate and petrified wood suitable for cutting and polishing were the gem materials collected during 1956. As in other years, there was no organized mining of gem stones in the State; production resulted from the efforts of hobbyists, vacationers, and individual collectors. In the more favorable areas ranchers opened their properties to collectors for a nominal fee. Most of the activity was in Yakima, Kittitas, and Klickitat Counties.

Tumbling methods developed during recent years for polishing gem materials continued to expand in scope. Much activity was directed toward developing new tumbling machines and techniques, especially to yield a finished product with a much higher polish.

**Gypsum.**—A substantial increase in the quantity of gypsite mined was reported by Agro Minerals, Inc., the only producer in the State, from its Poison Lake deposit near Tonasket (Okanogan County). The marketed product was used as land plaster.

Crude gypsum shipped into the State provided for a multi-million-dollar processing industry. The Seattle plant of Kaiser Gypsum Co., Inc., manufactured gypsum lath, wallboard, and sheathing and basecoat and molding plasters from raw material shipped by water from company-owned deposits on San Marcos Island (Baja California, Mexico). Columbia Gypsum Co., Ltd. (Spokane), processed crude gypsum from a quarry near Athalmer (British Columbia) for use as a cement retarder and for agricultural purposes.

**Lime.**—Output of lime by Roche Harbor Lime & Cement Co. up to September 30, 1956—when the plant closed permanently—was about 31 percent below 1955. Quick and hydrated lime was produced from limestone mined near the plant in San Juan County. The quicklime was used chiefly for building, chemical, and other industrial

[14] Kelly, H. J., Strandberg, K. G., and Mueller, J. I., Ceramic Industry Development and Raw-Material Resources of Oregon, Washington, Idaho, and Montana: Bureau of Mines Inf. Circ. 7752, 1956, 77 pp.

Digitized by Google

applications. A small quantity of hydrated lime was marketed for building purposes.

The Edna Bay Pure Stone Co.—a Texas corporation—in July announced plans for constructing a $5 million lime plant at Vancouver, Wash. The company reportedly completed negotiations with the Aluminum Company of America for long-term leasing of the latter company's Edna Bay (Alaska) limestone claims. Plans called for transporting the high-calcium limestone from Alaska to the Vancouver processing plant in self-unloading ships. The plant, which would produce lime for use by the cement, paper, sugar-beet, and carbide industries of the west coast, was scheduled to begin operations in 1957.

**Magnesium Compounds.**—Crude magnesite output by the Northwest Magnesite Co. (the leading producer of this commodity in the Nation) was 6 percent higher than in 1955. The company marketed refractory magnesia from beneficiated crude material mined at several of its quarries in Stevens County. The steel industry continued to be the principal consumer of this product.

Hydrous magnesium sulfate (epsomite) was recovered by Agro Minerals, Inc., from its deposit at Poison Lake (Okanogan County). This magnesium salt was used in fertilizers.

Production of olivine (magnesium silicate) by Northwest Olivine Co. from its Twin Sisters quarry (Skagit County) was substantially greater than in 1955. The quantity sold for use as foundry sand also increased significantly. Development by Twin Sisters Magnesium & Chrome Corp. was started at its Alamether-Begonia olivine deposit near Hamilton (Skagit County).

**Pumice.**—Pumice and pumicite, which totaled 5,291 tons in 1956, was substantially lower than in the preceding year. Arne Sorlie (Lakeside, Chelan County) and Entiat Pumice Co. (Ephrata, Grant County) were the leading producers. Superior Portland Cement, Inc. (Sentinel Mountain pit, Grant County), and Rainier Pumice Co. (Damnation Creek, King County) reported mining small quantities of pumicite. The chief use for both materials was as aggregate in manufacturing lightweight building block.

**Sand and Gravel.**—A 22-percent decrease was reported in sand and gravel output compared with 1955. The total production (16.8 million tons valued at $15.0 million) was distributed between commercial, 8.8 million tons ($8.3 million), and Government-and-contractor, 8.0 million tons ($6.7 million). Completion of major construction at The Dalles and Chief Joseph Dam by the United States Army Corps of Engineers resulted in a 5.4-million-ton drop in sand and gravel used by that agency. This decline was offset somewhat by a 1.4-million-ton increase by the Washington State Highway Department. The net result was that the decrease in the Government-and-contractor category represented 3.7 million of the total 4.8-million-ton deficit for 1956. Commercial production comprised the balance (1.1 million tons).

As in 1955, production of sand and gravel was reported from 35 of Washington's 39 counties. Pierce County ranked first in output, with a total of over 3.3 million tons. Other counties reporting over 1 million tons were Grant, King, Spokane, and Douglas. Based upon tonnage, 64 percent of the output was used for road building

Digitized by Google

and maintenance, 30 percent for other construction purposes, and 6 percent for railroad ballast and miscellaneous uses.

**TABLE 10.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | | Percent of change in— | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | Average | Short tons | Value | Average | Tonnage | Average value |
| COMMERCIAL OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 4,343,545 | $4,260,079 | $0.98 | 4,477,346 | $4,458,263 | $1.00 | +3 | +2 |
| Road material | 3,782,348 | 3,452,094 | .91 | 3,266,582 | 2,971,760 | .91 | −14 | 0 |
| Railroad ballast | 628,039 | 216,404 | .34 | 574,438 | 391,064 | .68 | −9 | +100 |
| Other [1] | 1,196,907 | 696,708 | .58 | 516,938 | 435,986 | .84 | −57 | +45 |
| Total | 9,950,839 | 8,625,285 | .87 | 8,835,304 | 8,257,073 | .93 | −11 | +7 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 4,692,626 | 4,246,947 | .91 | 500,551 | 552,854 | 1.10 | −89 | +21 |
| Road material | 7,001,696 | 6,478,450 | .93 | 7,505,937 | 6,227,201 | .83 | +7 | −11 |
| Total | 11,694,322 | 10,725,397 | .92 | 8,006,488 | 6,780,055 | .85 | −32 | −8 |
| TOTAL ALL OPERATIONS | | | | | | | | |
| Sand and gravel: | | | | | | | | |
| Building | 9,036,171 | 8,507,026 | .94 | 4,977,897 | 5,011,117 | 1.01 | −45 | +7 |
| Road material | 10,784,044 | 9,930,544 | .92 | 10,772,519 | 9,198,961 | .85 | 0 | −8 |
| Railroad ballast | 628,039 | 216,404 | .34 | 574,438 | 391,064 | .68 | −9 | +100 |
| Other [1] | 1,196,907 | 696,708 | .58 | 516,938 | 435,986 | .84 | −57 | +45 |
| Grand total | 21,645,161 | 19,350,682 | .89 | 16,841,792 | 15,037,128 | .89 | −22 | 0 |

[1] Includes glass, molding, engine, and ballast sands and sand and gravel used for miscellaneous unspecified purposes.

**Sodium Sulfate.**—Kearney Chemical Co., Inc., of Omak (Okanogan County), announced plans to recover sodium sulfate from mineral lakes in the vicinity. The salt was to be purified and dried at the lake sites. Use was to be made of this material in making Kraft paper.

**Stone.**—Gross output of stone in 1956 was 8.0 million tons valued at $11.6 million, compared with 6.6 million tons worth $10.6 million in 1955. The total was divided between commercial, 4.3 million tons ($7.8 million); and Government-and-contractor, 3.7 million tons ($3.8 million). Comparable figures for 1955 were commercial, 3.9 million tons ($8.0 million); and Government-and-contractor, 2.7 million tons ($2.6 million). The commercial advance (0.4 million tons) was brought about by large gains in output of basalt for roadstone, railroad ballast, and riprap and of crushed granite for riprap and rubble, and smaller advances for sandstone, mainly for metallurgical purposes, and for marble for terrazzo and roofing granules. In contrast, limestone production was about 11 percent below that in 1955. In the Government-and-contractor category, the increase (1.0 million tons) was attributed mainly to a larger quantity of stone used by the United States Army Corps of Engineers for riprap, roadstone, and miscellaneous purposes. Substantial gains also were made by the

Digitized by Google

Washington State Highway Department and the Bureau of Reclamation.

A limestone deposit north of Metaline (Pend Oreille County) was test-drilled by Hecla Mining Co. of Wallace, Idaho. The company conducted an exploration and development program to determine the extent and quality of the deposit. Big Smoke Uranium, Inc., of Spokane took leases on a large silica deposit on the Spokane Indian Reservation in southern Stevens County. The deposit was an outcrop that could be mined by open-pit methods.

**TABLE 11.—Stone sold or used, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Agriculture (limestone) | (1) | (1) | (1) | (1) |
| Building (dimension) | 6,496 | $281,936 | (1) | (1) |
| Concrete and roadstone | 4,329,413 | 5,201,254 | 4,609,482 | $5,601,685 |
| Riprap | 485,743 | 520,061 | 1,101,286 | 1,138,649 |
| Railroad ballast | (1) | (1) | 535,991 | 564,388 |
| Other [2] | 1,771,560 | 4,576,380 | 1,810,579 | 4,354,876 |
| Total | 6,593,212 | 10,579,631 | 8,057,338 | 11,659,598 |

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Used at cement, paper, metallurgical and chemical plants, and sugar refineries and for other unspecified purposes.

Stone quarrying was active in 36 of the State's 39 counties. The value of stone mined in the three leading counties—Skagit, King, and Stevens—represented about one-third of the Washington total.

Limestone was produced by cement companies at quarries in Skagit, Stevens, Pend Oreille, Whatcom, and Chelan Counties and also by Roche Harbor Lime & Cement Co. and Everett Lime Co., San Juan County; Mitchell Bay Lime Co., Whatcom County; and Peter Janni & Sons, Stevens County.

Marble for use mainly as terrazzo and roofing granules was mined in Stevens County by Manufacturers Mineral Co. and Washington Non-Metallics, Inc.

The principal producers of granite were Morrison-Knudsen Co., Inc., King County; and Great Northern Railway Co., Snohomish County. Other output was reported from Pierce and Stevens Counties. Monumental granite was quarried in Spokane and Stevens Counties.

The Walker Cut Stone Co., Inc., operated its Wilkeson quarry, Pierce County, and marketed rough and dressed sandstone. Sandstone was quarried and crushed for use in manufacturing silicon carbide by Exploration & Development Associates (Los Altos, Calif.) at a deposit near Springdale (Stevens County). Mineral Products Co. produced crushed sandstone for refractory and special sand purposes from a deposit near Chewelah.

Crushed quartz, used as a constituent in producing ferrosilicon, was prepared by Pacific Silica Co., Spokane County. Traprock, for use mainly as roadstone, was mined in 17 counties; principal production was from King, Snohomish, and Cowlitz Counties.

Digitized by Google

**Strontium.**—Manufacturers Mineral Co. operated the Gene Dunlap (formerly Sykes) strontium mine on Fidalgo Island (Skagit County), producing a small quantity for use by chemical companies in the Pacific Northwest.

**Talc and Soapstone.**—The output and value of soapstone were 13 and 24 percent less, respectively, than in 1955. All production came from Skagit County operations of Northwest Talc & Magnesium Co., Clear Lake; and William Soren (formerly Skagit Talc Products Co.) and Herman Smith, both of Marblemount. The Northwest Olivine Co. Rainbow open pit was idle during 1956. Development was done by Cascade Talc & Silica Co. and Otto Binchus (both near Marblemount).

Most of the soapstone mined was ground for use in insecticides; other applications included fertilizer mix and paint filler. Northwest Talc & Magnesium Co. ground some of its production, and Manufacturers Mineral Co. processed purchased raw material. Two Oregon organizations (Stauffer Chemical Co. and Miller Products Co., both of Portland) also ground soapstone from Washington.

**Vermiculite (Exfoliated).**—Exfoliation of vermiculite purchased from Montana by Vermiculite-Northwest, Inc. (Spokane), increased slightly over 1955. The expanded product was used as insulation and as aggregate in concrete and plaster.

## MINERAL FUELS

**Carbon Dioxide.**—Recovery of carbon dioxide from mineral waters by the Gas-Ice Corp. (Seattle) was about the same as in 1955. The company produced dry ice at plants in Klickitat County and at Ashland (Jackson County, Oreg.).

**Coal.**—Coal production was 22 percent below that in 1955, marking a continuous decline in output of this commodity since 1949; 11 mines supplied the total. Liquidation of the Northwest Improvement Co.—wholly owned subsidiary of Northern Pacific Railway Co.—began, and certain properties were transferred to the parent organization. According to the railway company, conversion to diesel power caused operations of the Northwestern Improvement Co. to dwindle to a point where liquidation was desirable. The mines of this company produced a substantial portion of the Washington total in 1956. Other major contributors included: Palmer Coking Coal Co., Inc., King County; and Roslyn Cascade Coal Co., Kittitas County. Smaller output was reported by B. & R. Coal Co., King County; and Tono Coal Mining Co. (formerly the Stoker Coal Co.) Thurston County.

High costs of operating and steadily declining market for Washington coal brought about by the availability of natural gas and competition from out-of-State producers figured prominently in the depressed output.

The feasibility of constructing and operating a steam-electric generating plant in the Roslyn area of Kittitas County was investigated for the Washington State Power Commission by an independent industrial engineering firm. The State power commission proposed construction of a steam-electric generating plant in this area to augment hydroelectric power during periods of short supply. The

Digitized by Google

proposed plant would require over 500,000 tons of coal annually from mines in the Roslyn area.

**Peat.**—Output of peat totaling 37,000 tons valued at $129,000 was slightly below that in 1955. Washington maintained its position as the second ranking peat-producing State in the Nation, being surpassed only by Florida. Most of the peat production was used for soil improvement; minor applications were as a medium for germinating seeds and starting cuttings and as a mulch.

**Petroleum and Natural Gas.**—Initial deliveries of natural gas from the San Juan oilfields of New Mexico were begun during the year. The arrival of natural gas drastically influenced the use of coal and oil in Washington for industrial purposes. A number of large industrial operations (including cement plants, brick and ceramic kilns, sugar refineries, pulp and paper mills, plywood driers, and metallurgical plants) shifted to natural gas for heating and industrial purposes. Construction of the West Coast Transmission Co., Ltd., pipeline from the Peace River oilfields of Canada was continued during the year. Expected delivery of natural gas through this pipeline was scheduled for late 1957.

During the year General Petroleum Corp. began a general development and expansion program at its Ferndale refinery that eventually would boost daily plant capacity from 35,000 to 48,000 barrels. The Texas Co. reportedly purchased a site at Marshes Point near Anacortes and was planning a $50-million, 35,000 barrel-per-day refinery for this location. Construction of the refinery was scheduled to begin in 1957. The U. S. Oil & Refining Co. announced plans to erect an oil refinery at Tacoma with an initial daily capacity of 6,000 to 7,000 barrels of crude.

## REVIEW BY COUNTIES AND DISTRICTS

**Adams.**—Basalt was crushed by F. H. DeAtley & Co. at Lind for roadstone and railroad ballast, and contractors supplied the Bureau of Reclamation with basalt for the Columbia Basin project. The State highway department used basalt and gravel for paving, and county road crews mined gravel for highway maintenance. Sand and gravel for construction and paving was marketed by Pre Mix Concrete, Inc.

**Asotin.**—Traprock and paving gravel were the only mineral commodities produced in Asotin County. The State highway department was furnished roadstone and paving gravel by contractors, and county highway crews and one contractor produced gravel for road building.

**Benton.**—Basalt was quarried by the Spokane, Portland & Seattle Railway Co. for railroad ballast and by contractors for road use by the State and county highway departments and also for riprap at Bureau of Reclamation projects. These Government agencies also were furnished gravel for various purposes. Three commercial operators produced sand and gravel.

**Chelan.**—Installed capacity of the Alcoa primary-aluminum plant near Wenatchee was enlarged to 108,500 tons annually—an increase of 8,500 tons—through installation of additional pots in each of the 4 potlines.

Digitized by Google

**TABLE 12.—Value of mineral production in Washington, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adams | $130,237 | $540,873 | Stone, sand and gravel. |
| Asotin | 6,105 | 261,885 | Do. |
| Benton | 150,624 | 492,568 | Sand and gravel, stone. |
| Chelan | 5,067,980 | 4,521,695 | Copper, gold, stone, sand and gravel, zinc, silver, pumice, lead. |
| Clallam | 252,954 | 552,720 | Stone, sand and gravel. |
| Clark | 543,938 | 375,866 | Stone, sand and gravel, clays. |
| Columbia | 170,291 | ---------- | |
| Cowlitz | 371,988 | 535,599 | Stone, sand and gravel. |
| Douglas | 2,072,516 | (1) | Sand and gravel, stone. |
| Ferry | (1) | (1) | Gold, silver, sand and gravel, copper, tungsten. |
| Franklin | 668,901 | 492,742 | Sand and gravel, stone. |
| Garfield | 7,978 | 48,222 | Stone. |
| Grant | 1,989,670 | 2,076,128 | Sand and gravel, diatomite, stone, pumice. |
| Grays Harbor | 256,740 | 310,992 | Sand and gravel, stone. |
| Island | 109,459 | 147,780 | Sand and gravel. |
| Jefferson | (1) | 219,835 | Stone, sand and gravel. |
| King | 9,168,626 | 8,713,784 | Cement, sand and gravel, stone, coal, clays, copper, gold, silver, pumice. |
| Kitsap | 133,252 | 154,641 | Sand and gravel, stone. |
| Kittitas | 3,454,198 | (1) | Coal, sand and gravel, diatomite, stone, gold, silver. |
| Klickitat | 2,447,733 | 1,136,909 | Sand and gravel, stone, carbon dioxide. |
| Lewis | 991,267 | 543,143 | Stone, sand and gravel, coal, clays. |
| Lincoln | 121,138 | 431,483 | Sand and gravel, stone, silver. |
| Mason | (1) | 24,150 | Stone, sand and gravel. |
| Okanogan | 238,904 | 393,963 | Sand and gravel, lead, gypsum, zinc, silver, stone, copper, epsomite, gold. |
| Pacific | 151,211 | 239,923 | Stone. |
| Pend Oreille | 8,708,522 | (1) | Zinc, lead, cement, stone, sand and gravel, silver, copper, gold. |
| Pierce | 2,502,171 | 2,609,384 | Sand and gravel, stone, clay, silver. |
| San Juan | (1) | (1) | Lime, stone. |
| Skagit | (1) | (1) | Cement, stone, sand and gravel, talc and soapstone, olivine, chromite, strontium. |
| Skamania | 60,643 | 30,029 | Stone, sand and gravel. |
| Snohomish | 1,359,097 | 1,626,611 | Sand and gravel, stone, clays, copper, gold, silver. |
| Spokane | 5,305,504 | (1) | Cement, sand and gravel, stone, clays, uranium. |
| Stevens | 8,164,095 | 7,217,921 | Zinc, magnesite, stone, lead, copper, sand and gravel, clays, silver, tungsten, gold, iron ore, uranium, grinding pebbles. |
| Thurston | 387,086 | 185,315 | Sand and gravel, coal, stone. |
| Wahkiakum | 14,300 | 200,180 | Stone, sand and gravel. |
| Walla Walla | 211,210 | 212,553 | Sand and gravel, stone. |
| Whatcom | (1) | (1) | Cement, stone, sand and gravel, clays. |
| Whitman | 436,227 | 323,351 | Stone, sand and gravel. |
| Yakima | 759,572 | 837,689 | Sand and gravel, stone, clays. |
| Undistributed [2] | 14,433,727 | 29,054,111 | |
| Total [3] | 67,334,000 | 61,665,000 | |

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes value of sand and gravel, stone, peat, and gem stones that cannot be assigned to specific counties and value of minerals for counties indicated in the table by footnote 1.
[3] Total adjusted to eliminate duplicating value of clays and stone.

Limestone for the Grotto (King County) plant of Northwestern Portland Cement Co. was quarried at Soda Springs. Basalt and granite, respectively, were supplied to the Bureau of Public Roads and the State highway department for roadstone. The General Stone Co. (formerly Wilkeson Wenatchee Stone Co.) did not produce any dimension sandstone from the Dry Gulch quarry during the year. Contractors provided paving and structural sands and paving gravel to the State for various purposes. Gravel for ballast was produced by the Great Northern Railway Co., and three commercial concerns processed sand and gravel. Pumice used mainly for making lightweight building block was mined by Arne Sorlie near Lakeside. The Wenatchee Brick & Tile Co. was inactive during the year.

*Lake Chelan District.*—Prospects for base-metal production in the State received a setback with the announcement by Howe Sound Co. that the Holden mine was to be closed. This mine has been the only

Digitized by Google

major copper producer in Washington. Rising costs and the drop in copper prices in the latter half of 1956 were factors leading to the decision to close the operation. The Holden deposit was discovered about 1900, but development was not begun until Howe Sound Co. acquired the property. Production was initiated in 1938, and output in the next 20 years totaled about 100,000 tons of copper, 20,000 tons of zinc, and substantial quantities of gold and silver. Ore was processed in a 2,000-ton flotation plant and the concentrate trucked over a mountain road 12 miles to Lake Chelan, then taken by boat 25 miles down the lake to Chelan for shipment to smelters.

The townsite of Holden was leased from the United States Forest Service with a provision that when the lease was terminated the buildings were to be removed or destroyed and the land allowed to return to its natural state. Exploration and development in 1956 at the mine totaled 7,271 feet of drifting and 19,480 feet of diamond drilling. An exploration project with DMEA financial assistance was continued with the objective of drifting on the main haulage level of the mine to undercut surface exposures of copper mineralization on Buckskin Mountain.

*Wenatchee River District.*—Production from the Lovitt Mining Co., Inc., Gold King mine continued at the same rate as in 1955. The mine was 1 of 3 major gold producers in the State. Exploration and development consisted of 4,434 feet of drifting, 1,506 feet of raising, and 22,446 feet of testhole drilling. Crude oil was shipped to a smelter.

**Clallam.**—Contractors furnished basalt for riprap to the United States Army Corps of Engineers and the National Park Service and granite for road maintenance to the State highway department. Paving gravel was provided for the Bureau of Public Roads and by county highway crews. Blake Sand & Gravel Co. (Sequim) and Pieler Construction Co. (Port Angeles) produced paving gravel.

**Clark.**—Aluminum Company of America expanded reduction opertions at Vancouver 2,500 tons annually to raise installed capacity to 97,500 tons. Fabricating facilities included a mill manufacturing aluminum rod, wire, and cable and an extrusion mill. Approximately 75 percent of the primary aluminum produced was processed further at Vancouver.

Basalt for riprap and roadstone was mined by Smithrock Quarry, Inc., and contractors furnished basalt to the State and county highway departments for road building. County highway crews produced gravel for road maintenance. Wilde Co. (Vancouver) processed molding sand, and four commercial operations provided sand and gravel for building, paving, and railroad ballast. Building brick and drain tile were manufactured by C. B. Muffett Brick & Tile Factory (Ridgefield) and Hidden Brick Co. (Vancouver) from locally mined clay. Plans were announced by the Edna Bay Pure Stone Co. for constructing a limeplant at Vancouver to process limestone from Edna Bay (Alaska). Silicon carbide was manufactured by Carborundum Co. at Vancouver from Oregon silica.

**Cowlitz.**—The Reynolds Metals Co. aluminum-reduction plant at Longview was the principal mineral-industry operation in Cowlitz County. Annual capacity was increased from 50,000 tons to 60,500.

Lakeside Bulldozing Co. and Weyerhaeuser Timber Co. quarried

Digitized by Google

basalt for roadstone and railroad ballast. Basalt for riprap and road building was supplied to the United States Army Corps of Engineers and the county highway department, respectively. Paving gravel was produced by county road crews, and contractors furnished structural and paving sands to the State highway department. Castle Rock Sand & Gravel Co., Woodland Sand & Gravel Co., and Guy Norris processed structural and paving gravels.

**Douglas.**—Keokuk Electro-Metals Co. produced silicon metal at its plant on the Columbia River at Rock Island and prepared to activate a fourth electric furnace.

The county maintained its position as the fourth ranking source of sand and gravel in Washington, in terms of value, despite a decrease to $1.4 million from $2.1 million in 1955. Contractors supplied the needs of the State highway department and United States Army Corps of Engineers for structural and paving sand and gravel. The Great Northern Railway Co. produced engine sand and gravel for ballast. Basalt for road building was furnished the Douglas County engineer and the State highway department.

**Ferry.**—Uranium prospectors were active in the Nancy Creek-Bisbee Mountain, Sherman Creek, and St. Peters Creek districts. Numerous occurrences of autunite, uranophane, and uraninite have been found in these districts; exploration work was done at several properties in 1955 and 1956. These districts comprised 1 of 3 areas where uranium occurrences are concentrated in the State; the other 2 areas were the Spokane Indian Reservation (Stevens County), and Mount Spokane (Spokane County). Development of uranium discoveries had not advanced as far in Ferry County as in the other two counties. Kelly Camp Tungsten Co. shipped a small quantity of tungsten concentrate from the Kelly Camp mine.

*Danville District.*—The Walla Walla group—a copper-gold prospect consisting of three claims on Big Goosmas Creek—was leased to Republic Copper Co. for further development. Exploration was planned to further open an ore exposure reportedly consisting of 16 inches of high-grade chalcopyrite and several additional feet of millable ore along a contact zone. Assays indicated values in copper, gold, and silver, with some platinum. The Granore Co. (United States subsidiary of Granby Mining, Smelting & Power Co., Ltd., of Copper Mountain, British Columbia) carried out a diamond-drilling program with a crew of six men at the old Lone Star copper mine in the same area. About 400,000 tons of 1 percent ore reportedly was available for open-pit mining, and an additional 200,000 tons of higher grade ore was established for underground mining at the property. The mine has been idle for the last 30 years, but in the period 1907–18 sizable tonnages of ore were produced by the British Columbia Copper Co., Ltd.

*Republic District.*—The Knob Hill mine and 400-ton flotation-cyanidation plant were active throughout 1956. The mine was the leading producer of gold and silver in Washington. A change in mining methods from overhand to horizontal cut-and-fill stoping was made to reduce the cost of development raising on the vein, which has a 60-degree dip, and subsequent stoping alongside. The former

Digitized by Google

type of raise employed was 3 compartments wide with 2 chutes separated by a manway. An article [15] stated:

> The new over-and-under, or slot-type raise, is comprised of a manway against the hanging wall over an untimbered chute that extends to the foot-wall. As the subsequent horizontal cut-and-fill stopes rise at each side of the slot raise, the horizontal timbers in the raise are removed and replaced with timbers designed to support the hydraulically placed sand that fills the stopes.

Sand and gravel furnished to the State highway department for road maintenance was the only nonmetal production in the county.

**Franklin.**—Connell Sand & Gravel Co. and Pre Mix Concrete, Inc., produced sand and gravel for building and paving purposes, and the county highway department contracted for paving gravel. The Northern Pacific Railway Co. processed railroad ballast from basalt and gravel. Contractors provided the Bureau of Reclamation and State highway department with crushed stone.

**Garfield.**—Basalt—the only mineral commodity mined in the county—was crushed for use as roadstone by county highway crews.

**Grant.**—Sand and gravel for building and paving purposes was produced by five commercial operators and by contractors for the State and county highway departments. Diatomite was mined and prepared for marketing at the Quincy operation of the Kenite Corp. Output, which was higher than in 1955, was used for filtration, filler, insulation, and miscellaneous purposes. Basalt was furnished to the county highway department and Bureau of Reclamation for use as riprap and to the State highway department for riprap and roadstone. Pumice was mined by the Entiat Pumice Co. at the Stormy Creek deposit. Production was limited because of severe winter damage to the equipment and storage bunkers. A small quantity of pumicite produced by Superior Portland Cement, Inc., at the Sentinel Mountain pit was used as an additive in concrete.

**Grays Harbor.**—Structural sand, paving gravel, and crushed basalt for roadstone were produced by Quigg Bros.-McDonald, Inc. Swano Excavating Co. processed paving gravel, and contractors supplied the State and county highway departments with raprap (granite) and road gravel, respectively.

**Island.**—Structural sand and gravel and paving gravel were produced by Christoe Sand & Gravel Co. and Mount Vernon Sand & Gravel Co. County road crews prepared road gravel.

**Jefferson.**—The General Construction Co. quarried basalt for use as riprap and roadstone. Crushed basalt and crushed granite were supplied by contractors to the United States Army Corps of Engineers and the State highway department, respectively. The State and county highway departments also were furnished paving sand and gravel.

**King.**—Metal-processing companies active in the Seattle area included Bethlehem Pacific Coast Steel Corp., The Bunker Hill Co., Isaacson Iron Works, Northwest Steel Rolling Mills, Inc., and Pacific Car & Foundry Co.

In December Bethlehem Pacific Coast Steel Corp. released details of a $25 million expansion program, which was to increase the steel-making capacity of its Seattle plant from 246,000 tons a year to 420,000. Five open-hearth furnaces fired by oil and gas were to be eliminated and replaced by two 100-ton electric furnaces, the largest

[15] Farmin, Rollin, Annual Review, Washington, Idaho, Oregon, California: Min. Eng., vol. 9, No. 2, February 1957, p. 153.

Digitized by Google

in the West. Also to be installed were a new 32-inch blooming mill to produce rolling-mill sizes from large ingot and a new rolling mill to replace the present 12-inch bar mill. The 22-inch rolling mill was to be modernized.

Beginning in the fall of 1959, electric power was to be supplied by the Seattle Light Department from the Gorge hydroelectric plant under construction on the Skagit River. Pending completion of the Gorge plant, power was to be supplied by Bonneville Power Administration, supplemented if necessary during periods of power shortages in a critical water year by steam-generated power from the Seattle Light Department. The two electric furnaces were rated at 25,000 kw. each on the basis of the power that would be drawn at the start of each melt. Average consumption on a year-round basis would be 16,000 kw.[16]

Isaacson Iron Works operated steel processing and fabricating facilities and added two bays for steel receiving and storage in the structural steel division.

Pacific Car & Foundry Co. maintained extensive foundry, forge, machine-shop, and steel-fabrication facilities. Production was utilized principally in manufacturing company-completed products, such as railroad cars, logging equipment, trucks, buses, and military vehicles. A new line of large rock- and ore-mover trucks for off-highway use was introduced by the company.

Northwest Lead Co. and the affiliated Associated Lead & Zinc Co. were fully acquired by The Bunker Hill Co. in 1956. The Bunker Hill Co., which operates base-metal mines and smelters at Kellogg, Idaho, had owned a controlling interest in the two concerns since 1931. Northwest Lead Co. became the Sales and Fabricating Division of The Bunker Hill Co. Manufacturing operations consisted of secondary-lead smelting and the fabrication and casting of a wide variety of lead products. Associated Lead & Zinc Co., which became known as the Chemical Products Division, continued to manufacture lead oxides, used in lead-acid storage batteries; litharge, for applications in ceramics and oil refining; and red lead, for paints and glassmaking.

Nonmetals and fuels valued at $8.6 million, a decrease of about $0.4 million below the 1955 level, continued to contribute to the rank of King County as the principal source of these commodities in Washington. The county continued to rank first in output value of cement and second in value of coal, dropped to second position in value of clays produced, and moved from third to second in value for both sand and gravel and stone output.

Limestone from Concrete (Skagit County) and Soda Springs (Chelan County) was used in cement by Superior Portland Cement, Inc. (Seattle) and Northwestern Portland Cement Co. (Grotto), respectively. Both companies employed locally mined miscellaneous clay in the process. Olympic Portland Cement Co., Ltd., Bellingham, Whatcom County, completed construction of a distributing plant on Harbor Island. Cement shipped by barge from the Bellingham plant was to be marketed in the Seattle area.

Glass and building sands were produced by Smith Bros. Silica Sand Co. from a deposit near Auburn, and Cavanaugh Molding Sand Co. processed a small quantity of molding sand from the Cedar Mountain

[16] Marple's Business Roundup, Jan. 9, 1957, p. 8.

Digitized by Google

operation near Renton. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. and the Northern Pacific Railway Co. dug gravel for railroad ballast and fill purposes. Paving gravel was mined by the City of Seattle Engineering Department and by contractors for the State highway department and United States Army Corps of Engineers. Eleven commercial concerns produced structural sand and gravel and paving gravel.

Stone was quarried by the Great Northern Railway Co. (basalt-ballast), by the Northern Pacific Railway Co. (basalt-riprap), and by contractors for the United States Army Corps of Engineers (basalt-riprap and roadstone) and the State highway department (granite-roadstone). Hemphill Bros., Inc., mined and crushed granite for use as poultry grit and roofing granules. Four commercial operators produced basalt and granite for riprap and roadstone; one concern marketed dimension basalt for landscaping.

Output of coal from the Landsburg, Franklin No. 10 and No. 12, and Kummer mines placed Palmer Coking Coal Co., Inc., first in the county and second in the State in production of this commodity. B. & R. Coal Co. Newcastle mine was second in output; Draghi Coal Co. and Macks Coal Co. also contributed to the county total. Peat was produced in the county.

Clays were mined by Gladding, McBean & Co. at four pits (Harris, Palmer, Newcastle, and Renton) for building brick and tile. Part of the output of the Harris pit was made into fire brick and block. Structural clay products also were manufactured by Abrahamson Brick Co., Builders Brick Co., and Seattle Brick & Tile Co. Flowerpots were marketed by Auburn Pottery Co., Inc.

Gypsum imported from Baja California (Mexico) was processed to wallboard, lath, and other gypsum products at the Kaiser Gypsum Co. plant in Seattle. A small quantity of screened pumicite for use as concrete aggregate was processed by Rainier Pumice Co. Soapstone from Skagit County was ground at the Manufacturers Mineral Co. plant in Seattle.

*Taylor River District.*—The Rainey copper mine was active from May through October. H & R Corp. of Everett (Snohomish County) leased the property on May 15 from Western States Copper & Uranium Corp. Ore was concentrated in a 50-ton flotation mill.

**Kitsap.**—Sand and gravel for structural and paving purposes was produced by crews of the county engineer and by three commercial operators. Contractors furnished the United States Army Corps of Engineers with sand and gravel and the State highway department with crushed granite for roadwork.

**Kittitas.**—Output of coal composed most of the county mineral-production value. Contributing to the coal mined were Northern Pacific Railway Coal Department (formerly Northwestern Improvement Co.) underground and surface mines and Roslyn Cascade Coal Co.

Gravel for railroad ballast was processed by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. Contractors furnished the State highway department with basalt for riprap and roadstone, and with paving sand and gravel.

Digitized by Google

Diatomite was mined by Western Ventures, Inc., at the Squaw Creek open pit near Ellensburg. The company sized, dried, milled, and sacked the material for sale as a filler.

*Swauk District.*—Gold ore was produced by Clarence B. Jordin and by Robert A. Bowman and Donald Price from the Ace-of-Diamonds and Anna May mines, respectively.

**Klickitat.**—The combined output value of sand and gravel and stone declined from $2.4 million in 1955 to $1.1 million in 1956. This decrease (principally in sand and gravel) was due almost entirely to completion of major construction at The Dalles Dam by the United States Army Corps of Engineers. Two commercial operators produced structural sand and gravel, and the Spokane, Portland & Seattle Railway Co. mined basalt for riprap and gravel for fill. Paving gravel and roadstone were used by county highway crews, and contractors supplied the needs of the United States Army Corps of Engineers for structural sand and gravel and riprap.

Natural carbon dioxide was recovered from mineral waters near Klickitat by the Gas-Ice Corp.

**Lewis.**—Basalt for railroad ballast was quarried by the Northern Pacific Railway Co., and basalt and structural sand and gravel were processed by the Pacific Sand & Gravel Co. Cowlitz Construction Co., Inc., produced paving gravel. Crews of the county road department provided most of their own requirements for roadstone and paving gravel. Contractors furnished the Bureau of Public Roads and State highway department with basalt and gravel for road maintenance. Clays mined by the Chehalis Brick & Tile Co. were made into building brick and tile at the company plant.

The Black Prince mine of Black Prince Coal Co. at Centralia was active.

**Lincoln.**—Paving gravel was produced by county road crews, and contractors supplied the State highway department with roadstone and gravel.

*Deer Trail District.*—Crystal City Mining Co. made a small shipment of lead ore from the Crystal City mine 22 miles north of Davenport.

**Mason.**—Crushed granite was furnished to the State highway department by contractors. Johns Creek Sand & Gravel Co. produced structural sand and gravel and paving gravel. County and State road crews used paving gravel for highway maintenance.

**Okanogan.**—Structural sand and gravel and paving gravel were produced by four commercial concerns. The State highway department used paving gravel and granite (riprap). Gypsite and a small quantity of epsomite for use as land plaster and as an ingredient in chemical fertilizer, respectively, were mined by Agro Minerals, Inc., of Tonasket.

A sodium sulfate deposit near Omak was under development by Kearney Chemical Co., Inc.

*Conconully (Ruby) District.*—Conconully Mines, Inc., operated the Peacock lead-zinc mine from April to November. Sherman Mining Co. diamond-drilled at its lead-zinc claims 3 miles west of Omak and planned shaft development. Two new buildings were completed at the shaft site. Previous development at the property consisted of a 1,000-foot tunnel driven about 1953 higher on the mountain.

Digitized by Google

**Pacific.**—Crushed basalt was processed by four commercial operators and by county road crews for highway maintenance. Contractors supplied this material to the State highway department.

**Pend Oreille.**—This county was eighth in nonmetal-output value in 1956 compared with sixth rank in 1955. Operations of Lehigh Portland Cement Co. continued to be the major nonmetal activity in the county. Limestone for use at that plant was quarried at Metaline Falls. A field study to determine the size and quality of a limestone deposit north of Metaline Falls was made by the Hecla Mining Co., Wallace, Idaho. The Great Northern Railway Co. dug gravel for fill, county road crews prepared paving gravel, and Romero Bros. marketed building sand and gravel. Contractors supplied the requirements of the United States Army Corps of Engineers and the State highway department for road gravel.

*Metaline District.*—The Grandview mine, operated by American Zinc, Lead & Smelting Co. under a lease and profit-sharing agreement, was one of the largest base-metal mines in Washington. Zinc production was greater than in 1955, and lead recovery continued at the rate established in that year. According to the company annual report, an agreement was made to purchase mine equipment owned by Grandview Mines, Inc. A lease and purchase agreement also was entered into on the real estate owned by the Grandview firm. It was believed that the reserve of lead-zinc ore in the Grandview mine, coupled with indicated tonnage on adjoining mineral rights that were to be developed after the Grandview was mined out, was sufficient to maintain the mill at maximum capacity for 10 to 12 years. American Zinc, Lead & Smelting Co. also operated the Lead Hill mine 2 months in connection with the annual assessment requirements.

Terms of a new 2-year contract entered into early in March by American Zinc, Lead & Smelting Co. and the International Union of Mine, Mill & Smelter Workers covering the 65 workers at the Grandview mine were published.[17] The settlement, based on a similar contract signed by the union and Pend Oreille Mines & Metals Co. in the same district in December 1955, provided for wage increases retroactive to July 1, 1955, and ranging from 10½ to 36 cents per hour depending upon wage classification; an additional, seventh paid holiday; and other benefits.

Pend Oreille Mines & Metals Co. operated the Pend Oreille lead-zinc mine throughout 1956, producing more ore than any other operation in the State. An accelerated development program was continued to increase ore output to between 750,000 and 800,000 tons in 1957, which would permit capacity operation of the company 2,400-ton East mill. At the end of 1956 employment was 190 men, including 110 underground workers. In progress was extension of the incline shaft by 2,500 feet to make a total length of 6,300 feet. This work was to be completed by February 1957. Waste rock from shaft sinking was loaded into skips by a crawler-mounted rocker shovel, hoisted to an underground crusher, and brought to the surface by the ore conveyor-belt system.[18] Also planned was installation of another

[17] The Wallace Miner, Mar. 8, 1956, vol. 50, No. 6, p. 1.
[18] Work cited in footnote 15.

Digitized by Google

crushing station at the 1,100-foot level and a 1,500-foot extension of the ore conveyor belt.[19]

LaSota-Jones Lead & Zinc Corp. began exploration at its property in the upper Slate Creek area under a DMEA contract. Lead ore was produced from the Rocky Creek claims by Jensen & McNamee.

*Newport District.*—Lead ore was shipped by R. C. McKelvie from the Comstock mine, which had been idle 15 years.

**Pierce.**—The copper smelter of American Smelting and Refining Co. operated continuously and processed concentrate from foreign sources, as well as domestic ore, concentrate, and scrap.

Kaiser Aluminum & Chemical Corp. added 18 reduction cells to bring capacity of its Tacoma facility to 38,500 tons of primary aluminum per year. Ohio Ferro-Alloys Corp. produced silicon metal for the aluminum industry and several grades of ferrosilicon for the iron and steel industry at Tacoma.

The county regained its position as the leading source of sand and gravel in Washington. Output valued at $2.1 million topped the 1955 total of $1.9 million. Nine commercial concerns processed sand and gravel for structural and paving purposes. Crews of the county road department and city of Tacoma produced sand and gravel, and contractors furnished the requirements of the United States Army Corps of Engineers and State highway department for these products. Stone was quarried by the Harrison Bros. Co. (basalt-roadstone), Kendall Construction Co. (granite-roadstone), crews of city of Tacoma (basalt-roadstone) and county road department (basalt-riprap), and contractors for the State highway department (granite-roadstone).

The Walker Cut Stone Co. quarried sandstone and marketed it as rough and dressed architectural stone and in crushed form for riprap. Heavy clay products were manufactured by Builders Brick Co. from clay mined at the Clay City pit. In addition to activity in nonmetal mining, the county was an important chemical-manufacturing area. Active plants included Hooker Electrochemical Co., Pennsylvania Salt Manufacturing Co., Stauffer Chemical Co., and E. I. du Pont de Nemours & Co. Products included caustic soda and other sodium compounds, ammonium nitrate, superphosphate, sulfuric, hydrochloric, and nitric acids, ammonia, and hydrogen.

A small quantity of coal was mined by the Carbonado Coal Co.

**San Juan.**—Limestone mining provided the raw material for the major mineral industry in the county—lime production. Roche Harbor Lime & Cement Co. converted limestone to quicklime for building and for chemical and other industrial purposes. Some of the limestone was ground for use as agricultural stone. The mine and plant of the Roche Harbor Lime & Cement Co., the only producing lime plant in the State, was closed September 30 and dismantling of the plant was begun. Limestone from the McGraw-Kittinger quarry was marketed to paper mills by the Everett Lime Co.

**Skagit.**—Chromite ore was produced by Vernon Pratt from the Cypress Island mine.

The position of the county with respect to nonmetal commodities remained unchanged from 1955. The county still ranked second in

[19] Mining World, vol. 8, No. 13, December 1956, p. 85.

Digitized by Google

value of all nonmetals in the State, first in stone output, and second in cement production. Limestone quarried at the Concrete workings by Superior Portland Cement, Inc., was used in manufacturing cement at the local plant and at the company plant in King County.

Soapstone was mined by the Northwest Talc & Magnesium Co. at its Clear Lake and Dad's Girl operations and by William Soren and Herman Smith at their mines near Marblemount. Assessment work was done at the Binchus property in the same area. Cascade Talc & Silica Co. did considerable development at a soapstone deposit on the Cascade highway about 10 miles from Marblemount. Plans called for starting mining early in 1957. The rock would be trucked to a Great Northern Railway Co. siding at Rockport.

Contractors furnished crushed granite and gravel to the State highway department for its road program. Basalt for riprap and gravel for paving were prepared by county highway crews. The Great Northern Railway Co. used gravel for railroad ballast, fill, and structural purposes. Paving and structural sand and gravel was produced by Marine Asphalt Co., Inc., and Mount Vernon Sand & Gravel Co., respectively.

Olivine was mined at an open-pit operation near Hamilton by Northwest Olivine Co. The product was well received by the industry for use as foundry sand. Twin Sisters Magnesium & Chrome Corp. mined a test lot of olivine from the Alamether-Begonia open pit.

Manufacturers Mineral Co. worked its LaConner strontium deposit. The material was processed and marketed to chemical companies in the area.

**Skamania.**—Roadstone and riprap (basalt) were quarried by county road crews and for the United States Army Corps of Engineers, respectively. Paving gravel was used by the State and county highway departments.

**Snohomish.**—Structural and paving sand and gravel was produced by seven commercial operators, and road crews of the county and city of Everett prepared paving gravel. State highway department gravel requirements were supplied by contractors. The Associated Sand & Gravel Co. and Clifton & Applegate quarried basalt for road use and railroad ballast. State highway crews were furnished crushed granite for road maintenance.

Granite also was produced by the Great Northern Railway Co. for railroad ballast and rubble, and by Manufacturers Mineral Co. for poultry grit and roadstone. Limestone for agricultural purposes was mined by Miller Lime Co. at Gold Bar. Heavy clay products were made by Lowell Brick & Tile Co. from locally mined clays.

*Glacier Peak District.*—Exploration activity was continued during the summer by Bear Creek Mining Co. at the optioned Glacier Peak copper property with a crew of 25 men. About 5,000 feet of diamond drilling was completed.

*Granite Falls District.*—Copper ore was shipped by April Mines, Inc.

*Index District.*—Development of copper prospects was undertaken by Broken Ridge Mining Co. and Rosaia Mining Co.

*Sultan District.*—Kromona Mines Corp. shipped copper concentrate from its Kromona property.

Digitized by Google

**Spokane.**—Kaiser Aluminum & Chemical Corp. added 16 reduction cells at the Mead plant to increase capacity to 176,000 tons of primary aluminum annually. At the company Trentwood rolling mill, production of aluminum sheet and plate advanced to a new record high. Pacific Northwest Alloys, Inc., produced ferrochromium at Mead.

Daybreak Uranium, Inc., was the principal shipper of uranium ore. From August 1955 to September 1956 a total of 6,250 tons was consigned to the Vitro Chemical Co. processing plant at Salt Lake City, Utah, from the company Daybreak (Dahl) mine and Huffman lease on the western foothills of Mount Spokane. Shipments were discontinued in the fall, pending completion of the new uranium mill at Ford (Stevens County). Proved ore reserves of 46,300 tons were reported.[20] North Star Uranium, Inc., acquired the Lehmbecher lease in October and made a test ore shipment. Also active in the Mount Spokane area were Dahl Uranium Mine, Inc., Dawn Uranium & Oil Co., and Affiliated Mines, Inc. The last-named firm obtained a DMEA contract for an exploration project on the Sprague lease.

A new zinc oxide plant, property of Northwest Refining & Chemical Co., was nearing production. The installation was to use both carbonate-base ore from Stevens County and silicate-base material from Coeur d'Alene district. Manufactured products were to be zinc oxide, leaded zinc oxide, and agricultural chemicals.

The county continued to rank third in the State in value of nonmetal output. Cement manufacture by Ideal Cement Co. at Irvin was a major mineral industry in Spokane County during 1956. The company hauled limestone from its Limerock quarry near Marble (Stevens County) to the Irvin plant for processing. Iron ore for use in the cement process came from Stevens County; clay and shale of local origin also were used at the plant.

Structural and paving sand and gravel was produced by 6 commercial operators at 9 locations. The Great Northern Railway Co. processed gravel for fill purposes Contractors furnished paving gravel for State highway needs and gravel to satisfy partial requirements of the county road department. Crews of the county also mined paving sand and gravel.

Roy C. Keene & Son quarried and dressed monumental granite. Vein quartz (silica), used mainly for making ferrosilicon, was mined at the Latshaw quarry by Pacific Silica Co. Basalt for roadstone and railroad ballast was quarried by Carbon Bros., The Green Co., Inland Asphalt Co., and county road crews. Roadstone was furnished to the State highway department by contractors. Fire brick and block were made from clay mined at the Tiano pit by Charles & Frank Pirello. Gladding, McBean & Co. made refractories and heavy clay products from clay from the Mica pit. The Washington Brick & Lime Co. mined clays at the Freeman, Mason, and Olson pits for processing to heavy clay products. Gypsum from British Columbia was marketed as a retarder in cement and for agricultural applications by Columbia Gypsum Co., Ltd. Vermiculite

[20] Work cited in footnote 6, p. 354.

Digitized by Google

shipped from Libby, Mont., was expanded at Spokane by Vermiculite-Northwest, Inc.

Field offices of the Bureau of Mines and Geological Survey and the DMEA were in Spokane. Personnel from the first two agencies comprised the field teams through which property examinations and inspections were conducted in conjunction with the DMEA program of loans for mineral exploration. The AEC also maintained an office in Spokane.

**Stevens.**—In September, Dawn Mining Co. began constructing the first uranium-ore-processing plant in the Pacific Northwest. The 400-ton-daily-capacity mill, to cost $3 million, was being built at Ford, 20 miles east of the company Midnite mine on the Spokane Indian Reservation. Up to 100 tons of custom ore meeting grade and amenability requirements was to be treated daily, in addition to the Midnite mine output. The treatment process was to involve dissolving ground ore in sulfuric acid, thickening the resulting pulp, and running the solution through ion-exchange beds of ammonium resins. After absorbing its capacity of uranium, the resin was to be washed and the uranium removed by chemicals which were to restore the resin for reuse. The plant was to use 500 to 600 tons of acid monthly.[21] Ore totaling 160,000 tons annually was to be trucked from the Midnite mine to the mill, which was to operate 24 hours per day. Production from the Midnite mine was being stockpiled pending completion of the mill. The ore reserve was reported to exceed 500,000 tons.

Dawn Mining Co., owned jointly by Newmont Mining Corp. and Midnite Mines, Inc., also began developing an adjoining 458-acre tract known as Boyd's lease. Uranium ore was shipped to a Salt Lake City (Utah) processing plant by Daybreak Uranium, Inc., from the Lowley lease, 7 miles south of the Midnite mine. Northwest Uranium Mines, Inc., initiated a DMEA project at its uranium holdings, and several other concerns also were active on the reservation.

Addy Development Co. shipped a small quantity of tungsten concentrate from the Washington Metals property. Iron ore was mined at the Kulzer property for special cements.

Magnesite output by Northwest Magnesite Co. increased over the 1955 total. The steel industry's demand for refractory magnesia was responsible for the greater production by the Nation's principal magnesite operation.

Limestone for use by Ideal Cement Co. (Spokane County) was quarried near Marble. Peter Janni & Sons supplied limestone to the paper and metallurgical industries. Granite for retaining walls and paving sand and gravel were produced by J. A. Terteling & Sons, Inc. Marble for use as terrazzo chips, roofing granules, and whiting was quarried by Manufacturers Mineral Co. (June Echo, Parks Red, and Valley White quarries) and Washington Non-Metallics, Inc. (Wa-No-Me quarry). Sandstone was mined by Exploration & Development Associates (for silicon carbide) and Mineral Products Co. (for foundry and blast sands, and refractory and filter purposes).

Sand and gravel for various uses was processed by the Great Northern Railway Co. (railroad ballast and fill), Colville Valley Concrete Co. (construction and road building), and the Chewelah city street

[21] Engineering and Mining Journal, vol. 158, No. 6, June 1957, p. 126.



Digitized by Google

department (paving gravel). Contractors furnished the State with gravel for highway maintenance.

Clays mined by the Washington Brick & Lime Co. at the Clayton and A. B. pits was used to make heavy clay products. Grinding pebbles were produced near Chewelah by Mineral Products Co.

*Chewelah District.*—Bonanza Lead Co. milled copper ore from the Copper Mountain mine.

*Northport (Aladdin) District.*—Goldfield Consolidated Mines Co. operated the Deep Creek mine from January 1 to November 21, at which time the mine was shut down owing to high operating costs and the difficulty being met in marketing zinc concentrate—the major product. The company was able to sell only about half of the 800 tons of zinc concentrate produced each month at its Sierra Zinc mill. About 45 men were employed in mining, trucking, and milling. The operation, consisting of the Sierra Zinc mine and mill, the Anderson mine, and the Deep Creek mine, was acquired by the company in 1948. The Deep Creek mine supplied the bulk of the company output.

A. G. Lotze, lessee from Gladstone Mountain Mining Co., shipped high-grade lead ore from a new deposit disclosed through stripping at the Gladstone mine. The top of the chimney deposit was uncovered 10 feet beneath the surface in an area partly covered by an old compressor building which was torn down in 1956.[22] Open-pit operations were initiated, and later an 80-foot incline shaft was sunk. A fire in October burned out the shaft and forced a shutdown, but mining and shipping of ore were expected to be resumed early in 1957. Shipments totaled 393 tons of ore containing 536,300 pounds of lead.

An exploration project by Goldfield Consolidated Mines Co. at the open-pit Lead Trust mine was terminated on August 1. The mine was purchased by A. C. Neiman, the former owner, on October 1. Exploration and development by Pacific Northwest Mining Co. at the Lucille lead mine consisted of 176 feet of drifts and 51 feet of raise. A. C. Neiman leased the Red Top mine August 1 and milled 450 tons of lead-zinc dump ore from the property at the Admiral mill. Goldfield Consolidated Mines Co. operated its Sierra Zinc mine in August and September. Production was from a small open pit which was started southwest of the mill to explore an outcropping. The deposit proved too small to operate profitably.

Production by American Smelting and Refining Co. from the open-pit Van Stone zinc mine was at the rate of 30,000 tons per month and more than 2,000 tons of waste was handled daily. Mining was done 5 days a week. The work was under contract by Isbell Construction Co. with a 25- to 30-man crew. The American Smelting and Refining Co. mill crew and staff totaled 37 men.

**Thurston.**—Contractors and county road crews produced gravel for road building and maintenance. Paving sand and granite roadstone were furnished by contractors to the State highway department, and the United States Army Corps of Engineers contracted for requirements of paving gravel and basalt for slope protection. The Tono No. 1 mine of the Tono Coal Mining Co. was active.

[22] Wallace Miner, June 14, 1956, vol. 50, No. 20, p. 4.

Digitized by Google

**Wahkiakum.**—Contractors mined gravel and basalt for use by the State highway department in its road-building program.

**Walla Walla.**—Jones-Scott Co. produced sand and gravel for building purposes and gravel for paving from two pits. County road crews processed gravel and crushed stone for highway maintenance; contractors supplied the gravel and roadstone requirements of the State highway department.

**Whatcom.**—The county continued to rank fourth in the State in value of output of nonmetal commodities; and, as in the case of the three counties ranked above Whatcom, cement manufacture was the major mineral industry. Olympic Portland Cement Co., Ltd., quarried limestone at the Kendall quarry and mined clays for use at its Bellingham plant. Limestone also was mined by Mitchell Bay Lime Co. at the Maple Falls quarry. Output was marketed to paper mills.

Crushed granite and gravel for highway building were supplied by contractors to the State highway department. Crews of the county and city of Bellingham road departments produced sand and gravel for maintenance. The Bureau of Public Roads received paving gravel from contractors. Sand and gravel for building and road work was prepared by the Lind Gravel Co. and C. V. Wilder Co.

**Whitman.**—Crushed basalt was prepared for road building by F. R. Hewett & Co., J. F. Konen Construction Co., and county road crews. Basalt and paving gravel were furnished to the State highway department by contractors. Foley Ready-Mix Co. of Colfax produced sand and gravel for construction purposes.

**Yakima.**—Sand and gravel for construction and road building was produced by 10 commercial concerns. Joe Marston quarried granite for curbing and flagging. Crushed basalt was prepared by R. H. Sussex and county road crews and for the Bureau of Reclamation and State highway department by contractors. Clay for making heavy clay products was mined by Granger Clay Products Co., and bentonite for lining irrigation canals and sealing dams was produced by Calco Industrial Minerals.

Digitized by Google

Digitized by Google

# The Mineral Industry of West Virginia

This chapter has been prepared under the cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the West Virginia Geologic and Economic Survey.

By James R. Kerr [1] and Jean Pendleton [2]

WEST VIRGINIA mineral production in 1956 increased 24 percent compared with 1955. As in past years, the larger coal-production value (26 percent) was the primary factor in the increased State mineral wealth. The State was again the leading producer of bituminous coal, mining more than 30 percent of the Nation's total and producing almost 66 million tons more than Pennsylvania, the second-ranking State.

Although coal production was West Virginia's outstanding mineral industry, constituting 88 percent of the State total, 15 other mineral commodities were produced; the more important in value were natural gas, natural-gas liquids, stone, sand and gravel, cement, and petroleum.

Leading counties in value of total mineral output were McDowell, Logan, Wyoming, Raleigh, Marion, Fayette, and Mingo—all coal-producing areas.

**TABLE 1.—Mineral production in West Virginia, 1955–56** [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 707,433 | $2,563,289 | 769,518 | $2,449,208 |
| Coal | 139,167,889 | 653,388,287 | 155,890,449 | 824,042,644 |
| Marl (calcareous) | (3) | (3) | 1,685 | 967 |
| Natural gas.....million cubic feet | 212,403 | 49,915,000 | 204,717 | 48,518,000 |
| Natural-gas liquids: | | | | |
| Natural gasoline.....thousand gallons | 35,756 | 2,352,000 | 35,728 | 2,594,000 |
| LP-gases.....do | 286,871 | 6,376,000 | 240,989 | 12,031,000 |
| Petroleum (crude).....thousand 42-gallon barrels | 2,320 | 7,080,000 | 2,179 | 8,411,000 |
| Salt (common) | 638,390 | 3,476,352 | 680,964 | 3,453,305 |
| Sand and gravel | 5,171,399 | 9,779,288 | 5,110,056 | 10,710,843 |
| Stone | 5,898,585 | 9,714,168 | 6,579,271 | 10,765,639 |
| Value of items that cannot be disclosed: Abrasive stones (1955), bromine, calcium-magnesium chloride, cement, lime, recovered elemental sulfur, and values indicated by footnote 2 | | 12,929,982 | | 14,589,866 |
| Total West Virginia [3] | | 755,512,000 | | 935,074,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total adjusted to avoid duplicating value of clays and stone used in cement and lime.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.



Digitized by Google

# REVIEW BY MINERAL COMMODITIES

## MINERAL FUELS

**Coal.**—The production of bituminous coal in West Virginia increased 12 percent compared with 1955. Logan County continued to lead the State in output; and McDowell County, second in total output, led in the value of coal produced. Other leading counties were Wyoming, Kanawha, Marion, and Harrison. Increased demand in each of the major coal-consuming industries—metallurgy, utility, and export—contributed to the upswing in coal production.

Underground mining at 1,278 mines made up 89 percent of the State production. Of the total underground yield, 98 percent was cut by machines (including the 8 percent mined by continuous miners), and 88 percent was power-drilled. Most of the underground output was loaded by mechanical means (87 percent). Mobile loaders were the primary loading devices: Loading into shuttle cars, 66 percent; into mine cars, 11 percent; and onto conveyors, 7 percent. Continuous mining machines accounted for 9 percent, handloaded face or room conveyors, 6 percent, and duckbills and self-loading conveyors 1 percent of the production that was mechanically loaded.

Strip and auger mining at 185 and 95 mines, respectively, contributed 8 and 3 percent to the State total.

Over 96 percent of the State production was shipped by railways or waterways and the remainder by trucks and other facilities. Thirty-one percent was crushed and 13 percent treated, using principally calcium chloride and oil before shipment. Of the total production, 29 percent was mechanically cleaned (54 percent by jigs, 39 percent wet washing other than jigs, and 7 percent by pneumatic methods).

A noteworthy event in the coal industry was organization of American Coal Shipping, Inc., by the coal industry, the United Mine Workers Union, and the principal coal-hauling railroads to protect the growing and important coal-export market. Immediate plans of the organization were to enter the ocean-shipping business by acquiring ships of its own and placing them in the export coal trade. Other problems concerning international movement of American coal were to be studied by the group.

Another development was the formation by Pittsburgh Consolidation Coal Co. and Standard Oil Co. (Ohio) of the Mountaineer Carbon Co., a jointly owned concern, to operate a carbon-calcining plant at Cresap, W. Va., about 25 miles south of Wheeling on the Ohio River. The plant will have a yearly capacity of 165,000 tons of high-grade calcined carbon, to be used principally for electrodes in aluminum reduction plants and other electrometallurgical and chemical production. Initial operation was expected in January 1958. About 200,000 tons of coke will be supplied by a $25 million coal-processing plant adjacent to the calcined carbon plant. Cresap is in the center of the area of rapidly expanding aluminum and chemical industries on the Ohio River.

An important merger was announced by Pittsburgh Consolidation with The Pocahontas Fuel Co., effective January 1957. Pittsburgh Consolidation also announced acquisition of 15,000 acres of undeveloped coal reserves in West Virginia from the Lorain Coal & Dock Co., Cleveland.

Digitized by Google

**TABLE 2.—Coal production in 1955–56, by counties, in short tons**

| County | 1955 | | 1956 | |
|---|---|---|---|---|
| | Total production | Average value per ton | Total production | Average value per ton |
| Barbour | 3,467,711 | $3.93 | 3,810,696 | $4.30 |
| Boone | 6,381,116 | 4.74 | 6,936,063 | 5.12 |
| Braxton | 126,132 | 3.18 | 102,743 | 4.45 |
| Brooke | 972,085 | 4.30 | 1,149,285 | 4.22 |
| Clay | 1,078,855 | 4.24 | 1,284,942 | 5.17 |
| Fayette | 7,410,756 | 4.79 | 8,096,501 | 5.78 |
| Gilmer | 150,691 | 3.25 | 265,483 | 4.27 |
| Grant | 65,403 | 4.56 | 67,420 | 4.73 |
| Greenbrier | 1,241,348 | 4.45 | 1,573,089 | 5.37 |
| Harrison | 8,425,514 | 3.67 | 10,062,494 | 4.16 |
| Kanawha | 9,088,770 | 4.53 | 10,623,660 | 4.81 |
| Lewis | 917,170 | 3.12 | 1,383,115 | 3.43 |
| Logan | 20,939,549 | 4.53 | 22,139,897 | 5.11 |
| McDowell | 18,848,329 | 5.62 | 19,923,834 | 6.48 |
| Marion | 9,040,725 | 4.90 | 10,292,362 | 5.24 |
| Mason | 152,338 | 2.92 | 194,417 | 3.45 |
| Mercer | 1,719,554 | 5.20 | 1,910,123 | 6.25 |
| Mineral | 36,076 | 3.56 | 132,514 | 4.11 |
| Mingo | 8,298,934 | 4.66 | 8,774,182 | 5.08 |
| Monongalia | 7,847,694 | 4.09 | 8,663,219 | 4.51 |
| Nicholas | 5,569,659 | 4.50 | 6,066,431 | 5.38 |
| Pocahontas | 366,533 | 5.97 | 479,035 | 5.74 |
| Preston | 2,402,412 | 3.27 | 2,742,249 | 3.53 |
| Putnam | 28,640 | 3.99 | 147,553 | 4.52 |
| Raleigh | 8,548,631 | 5.33 | 10,764,791 | 6.19 |
| Randolph | 1,256,851 | 5.24 | 1,027,129 | 5.64 |
| Taylor | 287,580 | 2.97 | 366,229 | 3.58 |
| Tucker | (1) | (1) | 135,266 | 3.53 |
| Upshur | 1,321,447 | 3.71 | 1,407,518 | 4.00 |
| Wayne | 125,290 | 3.72 | 106,816 | 8.75 |
| Webster | 856,048 | 5.61 | 1,212,848 | 5.60 |
| Wyoming | 10,522,890 | 5.03 | 12,250,204 | 5.86 |
| Undistributed | 1,673,158 | 4.16 | 1,796,321 | 4.57 |
| Total | 139,167,889 | 4.70 | 155,890,449 | 5.29 |

[1] Included with "Undistributed," which also includes data for Hancock, Lincoln (1955), Marshall, Ohio, Summers, and Tucker (1955) Counties.

**TABLE 3.—Coal production in West Virginia, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Value per ton | Year | Short tons | Value | Value per ton |
|---|---|---|---|---|---|---|---|
| 1947–51 (average) | 155,010,882 | $796,078,590 | $5.14 | 1954 | 115,996,041 | $541,369,652 | $4.67 |
| 1952 | 141,713,059 | 741,421,131 | 5.23 | 1955 | 139,167,889 | 653,388,287 | 4.70 |
| 1953 | 134,105,310 | 693,593,645 | 5.17 | 1956 | 155,890,449 | 824,042,644 | 5.29 |

**Coke and Coal Chemicals.**—Five oven-coke plants, including 813 ovens, were active in 1956, producing 4,197,400 tons of coke. Other cokemaking facilities included 703 beehive ovens, of which 402 were in operating condition on December 31, producing 104,440 tons of beehive coke; and 41 newly activated slot-type ovens with an annual capacity of 280,000 tons of coke. Recovered products at coke ovens included 254,387 tons of coke breeze; 67,332,640 thousand cubic feet of coke-oven gas; 106,446,092 pounds of ammonium sulfate; 59,880,906 gallons of coke-oven tar; 18,114,860 crude gallons of light oil, which includes 9,857,263 gallons of benzene, 2,554,091 gallons of toluene, 759,922 gallons of xylene; and 237,844 gallons of solvent naphtha.

**Petroleum and Natural Gas.**—The output of petroleum and natural gas decreased slightly in 1956, dropping 6 and 4 percent, respectively, compared with 1955.

Digitized by Google

In 1956, 809 well completions were reported by 43 counties. Calhoun, Ritchie, Logan, and Lincoln Counties led in well completions (accounting for 44.5 percent of all completion). Of the 809 wells completed 519 were gas; 58 oil; 63 oil and gas; 36 water injection, brine, and pressure wells; and 133 dry holes. The average depth of wells completed was 2,720 feet. The estimated number of producing wells at the end of 1956 were 14,420 gas and 12,772 oil. Drilling depths ranged from 110 to 8,030 feet.

Mingo County with 30 gas wells, produced over 32 percent of the West Virginia total. Leading gas-producing counties were Mingo, Logan, Calhoun, Lincoln, and Tucker, in order of decreasing output. Leading oil-producing counties were Calhoun, Jackson, Ritchie, Wirt, Kanawha, and Pleasants.

Many Devonian-shale gas wells were drilled in the southwestern part of the State during the year, and additional wells to the Oriskany Sand and Big Lime (Greenbrier) were drilled. Directional drilling along the Ohio River tested sands underlying the river. Many new wells and several old ones (gas and oil) were being fractured in the State with favorable results.[3]

Natural-gas liquids, natural gasoline, and LP-gases were produced in West Virginia again in 1956.

## METALS

**Iron and Steel.**—Weirton Steel Co., West Virginia's largest iron and steel producer, announced lighting of the world's largest open-hearth furnace. The 600-ton furnace was put into operation at the Weirton plant on the Ohio River.

Wheeling Steel Corp. announced a $65 million expansion of facilities, including the Benwood Works at Benwood, W. Va. The new steelmaking facilities will supplement the present open-hearth furnaces and eventually replace Bessemer converters. Modernization of the hot-strip mill and cold-rolling and finishing facilities will handle the increased ingotmaking capacity.

West Virginia Steel & Manufacturing Co. at Huntington was the remaining steel producer.

## NONMETALS

**Cement.**—Both portland and masonry cements were produced during 1956. Output, which was shipped exclusively by rail, was consumed primarily in Maryland, Virginia, and West Virginia. Twelve kilns were active during the year, operating an average of 325 days. The Standard Lime & Cement Co. reported a new cement kiln and grinding equipment in operation in April 1956. Production increased 13 percent during the year owing chiefly to the large new kiln put into production by Standard Lime & Cement Co.

**Clays.**—Output of clays in West Virginia in 1956 originated at 4 underground mines and 8 open pits. Fire-clay production made up 56 percent of the tonnage and 89 percent of the value and miscellaneous clay the balance. Total output of clays increased 9 percent over that of the preceding year, but the total value of production did not increase at a proportional rate because of variations in values of clays from the preceding year. Business conditions remained normal,

[3] Tucker, R. C., Assistant State Geologist, Morgantown, W. Va., Oil and Gas Developments in W. Va., 1956.

Digitized by Google

and labor conditions were reported as good. Labor rates and selling price went up August 31, 1956. The Crescent Brick Co., Inc., announced the utilization of roof bolts as a roof-control measure at the underground Hardins Run mine near New Cumberland.

The chief use for fire clay, produced primarily in Hancock County, was for refractories (primarily firebrick and block) and for use in foundries and steelworks. Miscellaneous clay production, concentrated in Berkeley County, was used for heavy clay products and in portland and other hydraulic cements.

**TABLE 4.—Clays sold or used by producers, 1947–51 (average) and 1952–56**

| Year | Fire clay | | Miscellaneous clay | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1947–51 (average) | 379, 530 | $980, 130 | 323, 356 | $261, 892 | 702, 886 | $1, 242, 022 |
| 1952 | 621, 996 | 2, 072, 688 | 360, 034 | 348, 981 | 982, 030 | 2, 421, 669 |
| 1953 | 677, 005 | 2, 213, 376 | 291, 833 | 275, 562 | 968, 838 | 2, 488, 938 |
| 1954 | 290, 256 | 1, 171, 495 | 296, 864 | 279, 044 | 587, 120 | 1, 450, 539 |
| 1955 | 406, 025 | 2, 277, 163 | 301, 408 | 286, 126 | 707, 433 | 2, 563, 289 |
| 1956 | 428, 033 | 2, 171, 942 | 341, 485 | 277, 266 | 769, 518 | 2, 449, 208 |

**Lime.**—The production of lime in West Virginia was concentrated in Berkeley and Jefferson Counties. Output was largely quicklime for chemical and industrial uses and for refractory material; small quantities of hydrated lime were also produced. High-magnesium limestone (dolomite) was calcined to produce dead-burned dolomite for refractory purposes. Most of the output was calcined in bituminous-coal-fired rotary kilns. Much of the State output was destined for consumption in the iron and steel industry, either as a flux in open-hearth furnaces or for refractory material (furnace linings); hence, much of West Virginia lime production depends on fluctuations in the iron and steel industry.

**Marl, Calcareous.**—Low demand and adverse weather conditions held down the production of calcareous marl in 1956. The material produced was used for agricultural purposes.

**Natural Salines.**—Bromine compounds and the double salt calcium-magnesium chloride were prepared from well brines obtained near South Charleston. Westvaco Chlor-Alkali Division, Food Machinery & Chemical Corp., closed its wells from June 20 to August 4, 1956, causing a 15-percent drop in output.

**Salt.**—Well brines furnished the salt output for West Virginia in 1956. Four producers reported active wells during the year. Most of the salt was used in brine form in chemicals and not marketed as salt. Principal use for both brines and evaporated salt was in manufacturing chlorine and other chemicals. Although production rose slightly over the preceding year, the value of production dropped owing to a drop in the output of evaporated salt (the item of higher unit value) and an increase in the output of brines that had a low unit value.

**Sand and Gravel.**—The output of sand and gravel remained substantially the same as in 1955. Most producers reported little variation in demand, as prices and wages remained relatively constant. Some complained of lower profits due to the high costs of repair parts.

The larger part of the output was dredged from West Virginia rivers, as 14 operators reported dredges active during the year. Thirteen

Digitized by Google

fixed plants were also active during the year; most of them processed small tonnages. Sand and gravel production was reported from 19 counties. Major uses for the output were for building and paving purposes, glass sand, engine sand, molding, and grinding and polishing. Hancock and Morgan were the leading producing counties.

**TABLE 5.—Sand and gravel sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Sand: | | | | |
| Building | 800,105 | $1,080,401 | (1) | (1) |
| Paving | 1,191,328 | 1,305,433 | 965,409 | $1,013,275 |
| Engine | 203,058 | 350,391 | (1) | (1) |
| Fire or furnace | (1) | (1) | 36,993 | 46,411 |
| Gravel: | | | | |
| Building | 774,681 | 929,238 | 726,116 | 815,899 |
| Paving | 657,737 | 750,517 | 820,870 | 1,067,090 |
| Other | 122,139 | 164,540 | 16,590 | 20,627 |
| Undistributed [2] | 1,422,351 | 5,198,768 | 2,544,078 | 7,747,541 |
| Total | 5,171,399 | 9,779,288 | 5,110,056 | 10,710,843 |

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes glass sand, building sand (1956), molding sand, grinding and polishing sands, engine sand (1956), fire or furnace sand (1955), blast sand (1955), railroad-ballast sand and gravel, and other sand.

**Stone.**—Stone production, consisting largely of limestone, increased 12 percent. Limestone producers reported a good demand; they also stated that there were shortages in the fall in some areas when production was curtailed owing to adverse weather conditions. Prices rose slightly, reflecting increases in wages and costs of material and supplies.

Limestone output was reported by 16 companies in 9 counties. The most important use for the crushed product was as fluxing agent in blast and open-hearth furnaces. Companies affiliated with steel corporations were among the leading producers. Other major uses of the product were for concrete aggregate and roadstone and as an ingredient in cement and lime.

Crushed sandstone, which was used entirely as concrete aggregate and roadstone, was produced by 3 companies in 3 counties; some was produced for use as riprap and for concrete aggregate and roadstone by Government-and-contractor operations.

**TABLE 6.—Crushed and broken stone sold or used by producers, 1955–56, by uses**

| Use | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons | Value | Short tons | Value |
| Flux | 2,813,611 | $4,689,624 | 2,864,147 | $5,001,336 |
| Concrete and roadstone | 1,374,743 | 2,188,805 | 1,198,804 | 2,038,075 |
| Railroad ballast | 141,196 | 200,494 | 562,947 | 538,156 |
| Agricultural (limestone) | 57,666 | 133,152 | 61,487 | 136,192 |
| Other [1] | 182,184 | 564,401 | 240,725 | 674,446 |
| Undistributed [2] | 1,329,185 | 1,937,692 | 1,651,161 | 2,377,434 |
| Total | 5,898,585 | 9,714,168 | 6,579,271 | 10,765,639 |

[1] Limestone for miscellaneous uses (rock dust, glass, asphalt filler, stone sand, and chemical).
[2] Limestone for cement and lime.

Digitized by Google

**Recovered Elemental Sulfur.**—Brimstone was recovered as a by-product in the liquid purification of gas by the Koppers process and by the coke process. Production was reported from Kanawha and Monongalia Counties.

## REVIEW BY COUNTIES

**Barbour.**—The two underground mines of Compass Coal Co. were by far the principal coal producers in the county. Other leading producers were the underground mines of Bethlehem-Cuba Iron Mines Co., Simpson Creek Collieries, Mountain Mining Co., Virgil Harris, Knight Coal Co.; and the strip pits of Grafton Coal Co., Coleman & Gay, L. E. Cleghorn, and the Mineral Coal Co., Inc., of West Virginia.

**Berkeley.**—Berkeley was the leading area in manufacturing cement and ranked second in both lime and limestone production. A considerable quantity of clay also was mined. The Martinsburg plant of the Standard Lime & Cement Co. was the preeminent cement-manufacturing site, producing vast quantities of portland cement and smaller quantities of masonry cement.

Standard Lime & Stone Co. and Jones and Laughlin Steel Corp., Blair Limestone Division (both of Martinsburg), quarried limestone primarily for use in their lime-manufacturing plants and as concrete aggregate, roadstone, blast-furnace flux, and railroad ballast. The J. E. Baker Co. (Inwood) and W. S. Frey (Martinsburg) reported limestone output for blast-furnace flux and as concrete aggregate and roadstone.

**TABLE 7.—Value of mineral production in West Virginia, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Barbour | $13,618,174 | $16,403,853 | Coal. |
| Berkeley | 9,339,616 | 11,166,896 | Cement, stone, lime, clays. |
| Boone | 30,252,129 | 35,532,340 | Coal. |
| Braxton | 401,327 | 456,921 | Do. |
| Brooke | 4,497,622 | 4,917,172 | Coal, sand and gravel. |
| Cabell | 565,271 | 628,599 | Sand and gravel, clays, stone. |
| Clay | 4,569,073 | 6,639,908 | Coal. |
| Fayette | (3) | 46,824,387 | Do. |
| Gilmer | 489,597 | 1,133,567 | Do. |
| Grant | (3) | (3) | Coal, stone. |
| Greenbrier | 7,011,322 | (3) | Do. |
| Hancock | (3) | (3) | Clays, sand and gravel, coal. |
| Harrison | 30,957,419 | 41,827,138 | Coal, sand and gravel. |
| Jackson | 47,691 | 19,346 | Sand and gravel. |
| Jefferson | (3) | (3) | Stone, lime, calcareous marl. |
| Kanawha | 44,150,070 | 53,677,100 | Coal, salt, sand and gravel, bromine, clays, calcium chloride, recovered elemental sulfur, stone. |
| Lewis | 2,873,412 | 4,753,105 | Coal, clays. |
| Lincoln | (3) | 28,321 | Sand and gravel. |
| Logan | 94,848,884 | 113,196,260 | Coal. |
| Marion | 44,268,079 | 53,918,497 | Do. |
| Marshall | (3) | (3) | Coal, salt. |
| Mason | (3) | (3) | Coal, salt, sand and gravel. |
| Mercer | 9,076,810 | 12,028,159 | Coal, stone, clays. |
| McDowell | 105,920,522 | 129,101,318 | Coal, stone. |
| Mineral | 153,600 | 560,859 | Do. |
| Mingo | (3) | 44,590,749 | Coal, sand and gravel. |
| Monongalia | 33,015,365 | 39,987,329 | Coal, stone, sand and gravel, recovered elemental sulfur. |
| Morgan | (3) | (3) | Sand and gravel. |
| Nicholas | (3) | (3) | Coal, stone, sand and gravel. |
| Ohio | (3) | (3) | Coal, sand and gravel. |

See footnotes at end of table.

Digitized by Google

TABLE 7.—Value of mineral production in West Virginia, 1955–56, by counties [1]—Continued

| County | 1955 | 1956 | Minerals produced in 1956 in order of value [2] |
|---|---|---|---|
| Pocahontas | $2,189,918 | $2,743,213 | Coal. |
| Preston | 9,962,334 | 11,945,487 | Coal, cement, stone. |
| Putnam | 114,273 | 667,124 | Coal. |
| Raleigh | (3) | 66,649,707 | Coal, sand and gravel. |
| Randolph | 6,762,425 | (3) | Coal, stone. |
| Summers | (3) | (3) | Do. |
| Taylor | 853,069 | 1,311,734 | Coal. |
| Tucker | (3) | 484,292 | Coal, sand and gravel. |
| Upshur | 4,911,178 | (3) | Coal, clays. |
| Wayne | 488,457 | 431,541 | Coal, sand and gravel. |
| Webster | 4,805,674 | 6,796,401 | Coal. |
| Wetzel | (3) | (3) | Sand and gravel. |
| Wood | 313,731 | 736,338 | Do. |
| Wyoming | 52,919,776 | 71,777,127 | Coal, sand and gravel. |
| Total fuels | 65,723,000 | 71,554,000 | |
| Undistributed | 170,412,312 | 82,580,618 | |
| Grand total | 755,512,000 | 935,074,000 | |

[1] The following counties were not listed because no tonnage was reported: Calhoun, Doddridge, Hampshire, Hardy, Monroe, Pendleton, Pleasants, Ritchie, Roane, Tyler, and Wirt.
[2] Fuels, including natural gas, natural-gas liquids, and petroleum are not listed by counties but given as State total.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Miscellaneous clay for heavy clay products was mined from the open pits of United Clay Products Co., North Mountain; and Continental Clay Products Co., Martinsburg.

**Boone.**—Of the 53 active coal mines, 47 were underground and supplied over 90 percent of total output. Eastern Gas & Fuel Associates and the Red Parrot Coal Co. were the leading underground producers, followed by Youghiogheny & Ohio Coal Co., Armco Steel Corp., Westmoreland Coal Co., Glogora Co., Anchor Coal Co., and Ridgeview Coal Co. The Red Parrot Coal Co. also mined considerable coal from an auger operation, as did Westmoreland Coal Co.

**Braxton.**—Output of coal (all from underground mines) was reported by the following eight producers, in order of decreasing tonnage: Barnett & Long Coal Co., Willis Coal Co., Cedar Creek Coal Co., Long Coal Co., Exploration Coal Co., Dobbins Coal Co., Fairmont-Shinnston Coal Co., and Cutlip & Straley Coal Co.

**Brooke.**—The underground mine of Windsor Power House Coal Co. yielded the bulk of coal output in Brooke County. The balance of production was mined from the strip and auger operations of K. & P. Construction Co.; the strip pits of Huberta Coal Co., Formis Coal Co., Stefkovich Bros., and Taylor Coal Co.; and the underground mines of Beech Bottom Coal Co., Liberty Colliery Co., Inc., Glen Brooke Coal Co., Fireside Fuel Co., Darwin Corp., Pot Rock Coal Co., and F. B. Olette Coal Co.

Fire or furnace sand and gravel was produced by The Brilliant Sand Co., Follansbee.

**Cabell.**—The most important mineral product of Cabell County was sand and gravel dredged from the Ohio River by the Ohio River Dredging Co., near Crown City; and Union Sand & Gravel, near Huntington. Output was used for building and paving purposes.

Digitized by Google

Barboursville Clay Manufacturing Co. (Barboursville) reported miscellaneous clay of red shale variety for use in heavy clay products.

A small quantity of crushed sandstone was produced by the city of Huntington for use in paving roads.

**Clay.**—Coal was mined from 5 underground mines and 1 strip pit in the county. Elk River Coal & Lumber Co. was the largest producer. Smaller underground mines were operated by Chemical Coal Co., Hickman Lumber Co., Osborne Brothers Coal Co., and Cannel Coal Co. Strip production was reported by Clay Coals, Inc.

**Fayette.**—Fayette County had 165 active coal mines in 1956, ranking 10th out of 36 coal-producing counties. Underground mines accounted for 90 percent of output. Primary producers, in order of decreasing tonnage, were New River & Pocahontas Coal Co., Eastern Gas & Fuel Associates, Milburn By-Products Coal Co., Southern Coal Corp., Ames Mining Co., The Gauley Mountain Coal Co., Electro-Metallurgical Co., Division of Union Carbon & Carbide Corp., and Royalty Smokeless Coal Co.

**Gilmer.**—The coal mined in Gilmer County was primarily from the strip pit of B. H. Swaney, Inc., and the strip and auger mines of R. & H. Coal Co. Small tonnages were reported from the underground mines of C. & L. Coal Co., L. & D. Coal Co., Little Kanawha Coal Co., R. & S. Coal Co., and Smith Coal Co.

**Grant.**—A small quantity of coal was produced from 12 mines, of which Stoney River Coal Co. mine was the largest.

Limestone for concrete aggregate, roadstone, and railroad ballast was quarried by Bean's Lime & Stone, Inc. (Petersburg). Oscar Keplinger (Maysville) also reported producing a small quantity of limestone for agricultural purposes.

**Greenbrier.**—The underground mines of Donegan Coal & Coke Co., Left Fork Fuel, Inc., and The Raine Lumber & Coal Co. and the strip mine of Lafayette Springs Coal Co. supplied over half of the county output. The balance of production was reported from 92 smaller mines.

The Acme Limestone Co. (near Fort Spring) quarried a large quantity of limestone for use as concrete aggregate, roadstone, railroad ballast, stone sand, dust for coal mines, chemicals, and agricultural purposes. The H. Frazier Co., Inc. (Fort Spring), reported limestone production for use as railroad ballast. Crushed sandstone for concrete and roadstone was quarried by West Virginia Conservation Commission.

**Hancock.**—Hancock County ranked first in the State in clay production. The leading fire-clay producer was Globe Brick Co., Newell, followed by Crescent Brick Co., and West Virginia Fire Clay Manufacturing Co., both of New Cumberland. Output was used for firebrick and block, foundries and steelworks, and mortar.

The Nos. 8 and 9 dredge operations of Dravo Corp. Keystone Division near Moscow continued to produce large quantities of sand and gravel for building and paving purposes. Owing to the company's high productivity, Hancock ranked second among the 19 sand- and gravel-producing counties.

A small quantity of coal was mined from the underground mine of A. A. A. L. W. Mining Corp. and the strip pit of M. & E. Coal Co.

Digitized by Google

**Harrison.**—Coal mining flourished in 1956, with 123 mines reporting over 10 million tons of coal—an increase of over 1.5 million from 1955. The underground mines of Consolidation Coal Co. and Compass Coal Co. supplied a large portion of output. Relatively high production also was reported by the underground mine of Galloway Land Co., the strip and auger operation of Tasa Coal Co., and the underground mine of Robey Run Coal Co.

**Jackson.**—Sand for paving roads was the principal product of Ravenswood Sand & Gravel Co. (Ravenswood). A small quantity of gravel for use as a filler and for building purposes also was produced by the company.

**Jefferson.**—Jefferson County was the leading area in limestone and lime production and the only source of calcareous marl in West Virginia. United States Steel Corp., Michigan Limestone Division (Millville), Jones & Laughlin Steel Corp., Blair Limestone Division (Harpers Ferry), and the Bakerton and Millville plants of Standard Lime & Cement Co. (near Engle and Millville, respectively) reported limestone quarried for metallurgical use, concrete and roadstone, railroad ballast, and agricultural purposes.

Standard Lime & Cement Co. reported lime for refractory material from the Millville plant and quicklime and hydrated lime from the Bakerton plant. Jones & Laughlin Steel Corp. calcined dolomite primarily for use as refractory material (dead-burned dolomite).

Calcareous marl was mined for agricultural purposes by West Virginia Lime Co. (Charles Town).

**Kanawha.**—Coal production composed 95 percent of the mineral value of Kanawha County. Salt, sand and gravel, natural salines (bromine and bromine compounds and calcium-magnesium chloride), clays, sulfur, and stone were the other minerals of value. Ninety percent of the coal was mined from 76 underground mines, 4 of which were operated by the Carbon Fuel Co., 9 by Truax-Traer Coal Co., and 4 by the Valley Camp Coal Co.—the 3 largest producers.

Westvaco Chlor Alkali Division of Food Machinery & Chemical Corp. near Charleston continued to produce vacuum-pan-evaporated salt to manufacture chlorine. The company also refined natural salines to obtain bromine compounds and calcium-magnesium chloride.

Sand and gravel for building and paving was produced by Pfaff & Smith Builders Supply Co. (Charleston). St. Albans Sand Co. (Calvert) produced engine sand and Charleston Sand Corp. (Big Chimney) building sand. The Zenith Sand Co., Inc., a former producer, discontinued operations.

West Virginia Brick Co. (Charleston) and Charleston Clay Products Co. mined fire clay for heavy clay products.

The E. I. du Pont de Nemours & Co., Inc., recovered sulfur in the liquid purification of gas from the company's Belle Works plant at Belle.

A small quantity of sandstone for concrete aggregate and roadstone was quarried by the West Virginia Conservation Commission.

**Lewis.**—The strip and auger operations of Bitner Fuel Co., the leading producer, and Keeley Construction Co. yielded the bulk of the coal output of Lewis County. The balance of production was reported from the strip pits of Swaney Contracting Co., Marino Coal

Digitized by Google

Co., Yochym Bros. Coal Co., and King Bros. Coal Co. and the underground mine of Weston State Hospital.

Miscellaneous clay for heavy-clay products was mined from open pits by Weston Brick & Coal Co., Weston; and Jane Lew Brick & Tile Co., Jane Lew.

**Lincoln.**—Engine sand was produced from the dredge operations of Davis & Adkins Sand Co. and Dean Coal & Sand Co., both of Ferrellsburg; and Guyan River Co., near Midkiff. The quarry of Hal Dial & Sons was idle.

**Logan.**—Logan County led, for the second consecutive year, in the production of coal. Nearly 75 percent of the 22 million tons mined was reported from the following companies operating a total of 25 mines: Island Creek Coal Co., Amherst Coal Co., Guyan Eagle Coal Co., Omar Mining Co., The Powellton Coal Co., The Lorado Coal Mining Co., and Jewell Eagle Coal Co.

**Marion.**—Virtually all of the coal in Marion County was mined underground. The county was one of the larger coal-producing areas primarily due to the high productivity of Bethlehem-Cuba Iron Mines, Eastern Gas & Fuel Associates, Consolidation Coal Co., Jamison Coal & Coke Co., and Rochester & Pittsburgh Coal Co. These companies represented nearly 90 percent of the county output of coal.

**Marshall.**—Of the three salt-producing counties of West Virginia, the largest production was from Marshall. The Natrium Chemical plant of Columbia Southern and the Solvay Process Division, Allied Chemical & Dye Corp., utilized brine from wells for chlorine and chemicals.

Coal was mined for commercial use from the underground operation of the Valley Camp Coal Co.; a small quantity was mined by the West Virginia State Penitentiary.

**Mason.**—Output of coal was reported from four underground mines operated by Lieving Coal Co. (the primary producer), Richard Coal Co., Hudson Bros. Coal Co., and J. F. Icenhower.

Evaporated salt was produced by the Liverpool Salt Co. near Hartford.

Sand and gravel was produced by Pete Roush for The Letart Sand & Gravel Co., Inc. (near Letart). Output was used for cinder and concrete block and for paving roads.

**McDowell.**—McDowell County ranked second in coal production and reported more active mines than any other county in the State. Of a total of 171 mines—all producing over 1,000 tons—154 were underground, 10 strip, and 7 auger. Three-fourths of the coal produced came from underground mines of United States Steel Corp., Pocahontas Fuel Co., Inc., Island Creek Coal Co., Olga Coal Co., New River & Pocahontas Consolidated Coal Co., and Eastern Gas & Fuel Associates.

Sandstone was quarried and crushed at the Superior plant of Brown & Wright near Princeton for concrete and roadstone.

**Mercer.**—The three mines of American Coal Co. of Allegany County (underground, strip, and auger) yielded the bulk of coal output in the county. Substantial quantities also were reported from the underground mines of Crozer Coal & Land Co., Weyanoke Coal & Coke Co., and Winding Gulf Coals, Inc.

Digitized by Google

Bluefield Limestone Co. (Bluefield) produced crushed limestone for concrete aggregate and roadstone.

Miscellaneous clay was mined by Virginia Brick & Tile Co., Princeton, for heavy-clay products.

**Mineral.**—Seven mines reported coal production; 6 were deep operations, and 1 was a strip mine. The combined output from Mastellar Coal Co. and the Pine Swamp Mining Co. accounted for the bulk of the output.

Limestone for concrete and agricultural purposes was quarried by Earl L. Spencer of Keyser.

**Mingo.**—The principal commodity of Mingo County was coal, primarily from the seven underground mines of Island Creek Coal Co. Considerable tonnages also were mined from the underground and auger mines of Sycamore Coal Co.; the underground and strip mines of Ames Coal Co.; and the underground mines of Gay Mining Co., Kimberling Collieries Co., Lando Coal Corp., Crystal Block Coal & Coke Co., and Burning Springs Collieries Co.

Guyan Valley Sand Co. (Gilbert) produced engine sand for mine locomotives.

**Monongalia.**—Coal production, exceeding 8 million tons, was mined almost entirely from underground mines (99.9 percent). Output from Christopher Coal Co. mines composed the major proportion of the output. The Valley Camp Coal Co., South Union Coal Co., and Trotter Coal Co. produced considerable tonnages.

Limestone for concrete and roadstone—the primary uses—and for stone sand and agricultural use was quarried by Greer Limestone Co. (Greer).

Decker's Creek Sand Co. (Morgantown), produced glass and engine sands and grinding and polishing sands at the company fixed plant near Greer.

Recovered sulfur was obtained from liquid purification of gas at the Morgantown plant of Olin Mathieson Chemical Corp.

**Morgan.**—Sandstone, ground principally for use as glass sand, was quarried by the Pennsylvania Glass Sand Corp. (Berkeley Springs). Molding, grinding, and engine sands were other commodities produced.

**Nicholas.**—The largest producers of coal (the leading mineral of the county) were Johnstown Coal & Coke Co., Potters Creek Coal Co., Imperial Smokeless Coal Co., Tioga Coal Corp., and Richwood Sewell Coal Co. Excavators, Inc., and Tasa Coal Co. mined the bulk of the strip coal.

Keeley Construction Co. quarried sandstone near Clarksburg for concrete and roadstone.

Nettie Sand Co. (Nettie) continued to produce sand for building purposes.

**Ohio.**—Virtually all coal production was mined from the two underground operations of Valley Camp Coal Co. The balance of output was a small quantity reported by the Dependable Coal Co.

Sand and gravel for building purposes was dredged from the Ohio River near Wheeling by H. L. Seabright Co.

**Pocahontas.**—Most of the coal output in the county was from the underground mines of Maust Coal & Coke Co. The remainder was reported from underground mines of Harris Coal Co., Ellis Coal Co.,

Digitized by Google

the strip pit of Beckley Coal & Coke Co., and the auger operation of Erickson & Bowers.

**Preston.**—The strip mine of Kingwood Mining Co. was the largest coal operation, followed by underground mines of Kray Coal Co. and the Industrial Coal Co.

Limestone was quarried by the Alpha Portland Cement Co. for manufacturing cement at the company Manheim plant. A small quantity of sandstone was produced as concrete aggregate and roadstone at Terra Alta by Paul E. Garbart.

**Putnam.**—The strip mine of Whit Coal Co. was the primary source of coal output. The balance of production was obtained from the small underground operations of H. S. B. Thomas, D. G. Thomas, C. E. Lane, J. E. Holloway, and George Muck Coal Co. and the auger mine of Yonker Coal Co.

**Raleigh.**—Owing to a 26-percent increase in production, Raleigh County rose from sixth to fourth place among the coal-producing counties. The bulk of output was mined underground; the primary producers were Eastern Gas & Fuel Associates, The New River Co., Slab Fork Coal Co., Armco Steel Corp., Lillybrook Coal Co., Raleigh-Wyoming Mining Co., and C. H. Meade Coal Co.

The Table Rock Sand Co. (Crow) and Grandview Sand Co. (Beaver) produced sand for building.

**Randolph.**—Bethlehem Cuba Iron Mines was the primary producer of deep-mined coal, and Roaring Creek Coal Co. was the largest strip producer. Substantial tonnages also were reported from the deep mines of Three Fork Coal Co. and Norton Coal Co.

Limestone was quarried and crushed by Elkins Limestone Co. (Elkins) principally for use in concrete and roadstone, and also for agricultural purposes.

**Summers.**—A small quantity of coal was produced in the county from the underground mines of Flanagan Coal & Lumber Co. and Springdale Coal Co.

The West Virginia Conservation Commission reported output of a small quantity of limestone for use as concrete aggregate and roadstone.

**Taylor.**—The strip mine of C. & P. Coal Co. was the major source of coal in the county. Relatively large tonnages also were mined from the strip pit of Sinsel Coal Co. and the underground mines of Wendel Coal Co. and Mearns Mining Co.

**Tucker.**—Virtually all of the coal was strip-mined by Thomas Engineering Co. and North East Mining Co. A small output of deep-mined coal was reported by Pierce Coal Co.

Sand and gravel for use as building and paving material was produced by the Fairfax Sand & Crushed Stone Co. near Thomas.

**Upshur.**—Coal and clay were taken from mines in Upshur County. Nearly 78 percent of the coal output was mined from the underground operations of Reppert-Fairmont Coal Co. (the primary producer), Peck's Run Coal Co., Hackers Creek Coal Co., Redstone Coal Mining Co., Inc., and Badger Coal Co.

Fire clay was reported by Buckhannon Brick Co. (Buckhannon). The product was used for building tile and brick and drain tile.

465877—58——80

Digitized by Google

**Wayne.**—Coal was produced from underground mines operated primarily by Trace Fork Coal Co., Big Lynn Coal Co., and Fry Bros. Coal Co. Smaller tonnages were mined by Andrew J. Frey Coal Co., Russell Coal Co., Fry & Napier Coal Mining Co., and Southern Coal Co.

Engine sand was produced by Laval Sand Co., Inc., near Fort Gay.

**Webster.**—The underground mines of Pardee & Curtain Lumber Co., Williams River Coal Co., and Elk Lick Coal Co. were the principal coal-producing properties in the county. The balance of output was supplied by 6 additional deep mines and 3 auger operations.

**Wetzel.**—Wetzel County was an important area in production of sand and gravel for building and paving purposes. Output was reported by the Ohio Valley Sand Co. and the Ohio River Sand & Gravel Corp., both of New Martinsville.

**Wood.**—Wood was the third-ranking county in sand and gravel production. Output for use in building and paving was reported by Kanawha Sand Co. (Parkersburg) and Duquesne Sand Co., operating a dredge on the Ohio River. The Ohio River Sand & Gravel Corp. (Parkersburg) produced paving gravel.

**Wyoming.**—Eighty-four mines producing over 12 million tons of coal kept Wyoming County one of the leading areas for coal mining. The three largest companies—all operating underground mines—were Pocahontas Fuel Co., Eastern Gas & Fuel Associates, and Semet-Solvay Division, Allied Chemical & Dye Corp. Other deep mines producing substantial tonnages were Island Creek Coal Co., American Coal Co. of Allegany County, and Crozer Coal & Land Co.

Casto & Lackey reported producing engine sand from a dredge at Baileysville.

Digitized by Google

# The Mineral Industry of Wisconsin

This chapter has been prepared under a cooperative agreement for the collection of mineral data, between the Bureau of Mines, Department of the Interior, and the Geological Survey of Wisconsin.

By Lenox H. Rand[1]

MINERAL production in Wisconsin in 1956, valued at nearly $66 million, was virtually the same as in 1955. Notable increases in the production and value of zinc, lead, and lime were offset by declines in production and value of iron ore, sand and gravel, and cement. Reduced output of iron ore undoubtedly was due to the 36-day steel strike in mid-1956. Exploration near Butternut, Ashland County, by a group of companies indicated iron-bearing formations that may be amenable to economic beneficiation. Samples of this material were shipped to Hibbing, Minn., for testing. The stable price structure of lead and zinc in 1956, at levels permitting profitable exploitation, stimulated production from Wisconsin mines. The 1956 output represents a peak for lead since 1920 and for zinc since 1927.

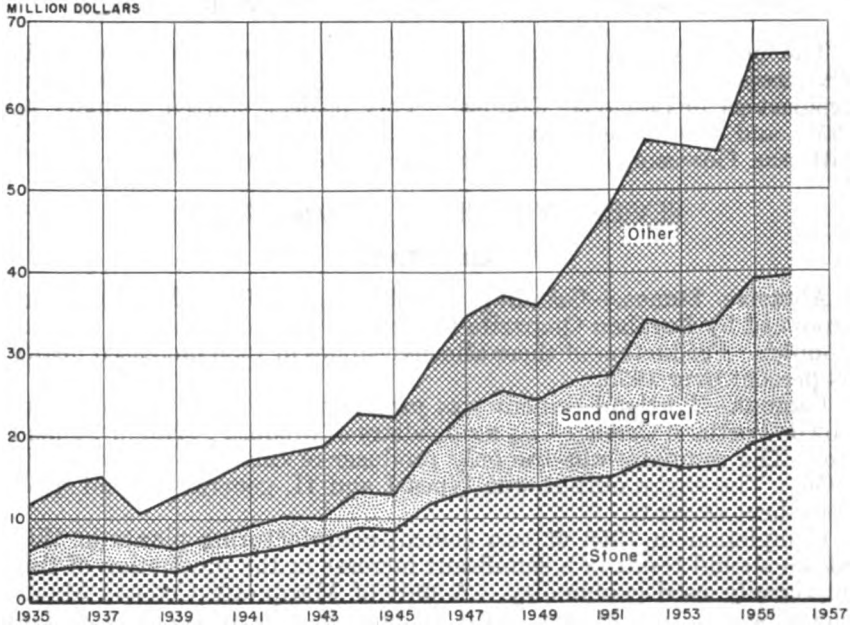



FIGURE 1.—Value of sand and gravel, stone, and total value of all minerals produced in Wisconsin, 1935–56.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.



Digitized by Google

Owing to completion of two new cement plants in Milwaukee in 1956, the output of this important mineral will increase considerably in future years.

TABLE 1.—Mineral production in Wisconsin, 1955–56 [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Abrasive stones (grinding pebbles) | 681 | $21,111 | 1,093 | $31,150 |
| Clays | 165,068 | 166,030 | 163,089 | 172,087 |
| Iron ore (usable) long tons, gross weight | 1,886,029 | (2) | 1,488,361 | (2) |
| Lead (recoverable content of ores, etc.) | 1,948 | 580,504 | 2,582 | 810,748 |
| Lime | 134,535 | 1,767,563 | (2) | (2) |
| Marl, calcareous | 14,087 | 7,330 | 11,074 | 5,603 |
| Sand and gravel | 27,978,335 | 19,958,450 | 27,715,171 | 19,097,155 |
| Stone | [3] 12,180,452 | [3] 18,843,272 | 11,125,875 | 20,401,864 |
| Zinc (recoverable content of ores, etc.) | 18,326 | 4,508,196 | 23,890 | 6,545,860 |
| Value of items that cannot be disclosed: Abrasive stone (tube-mill liners), basalt (1955), cement, gem stone (1955), and values indicated by footnote 2 | | 20,528,432 | | 19,450,726 |
| Total Wisconsin [4] | | 65,813,000 | | 65,860,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Excludes basalt; included with "Value of Items that cannot be disclosed."
[4] Total adjusted to eliminate duplicating value of clays and stone.

## DEFENSE MINERALS EXPLORATION ADMINISTRATION

The only DMEA contract for minerals exploration in effect in Wisconsin in 1956 was the contract with Paul Gille for lead-zinc exploration in Lafayette County. This project started January 6, 1955, and terminated June 29, 1956. The total cost was $24,846 with the Government sharing 50 percent of the cost.

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Abrasive Stones.**—Grinding pebbles and tube-mill liners were produced by Baraboo Quartzite Co. from a quartzite deposit in Sauk County. Production of these abrasive stones in 1956 increased nearly 68 percent over 1955.

**Cement.**—Portland cement was produced in Manitowoc by Manitowoc Portland Cement Co., a subsidiary of Medusa Portland Cement Co. The company was the only producer of cement in the State in 1956. The entire output was types I and II, general-use and moderate-heat cements.

Completion in 1956 of two cement-manufacturing plants in Wisconsin should result in a significant increase in the production of that universally used commodity. A unit of Marquette Cement Manufacturing Co., of Chicago, with an annual capacity of 1.25 million barrels, was erected almost in the heart of downtown Milwaukee. This plant is the first installation in the United States using the ACL (Allis-Chalmers-Lellep) process, developed by Allis-Chalmers Manu-

Digitized by Google

facturing Co. Substantial savings in fuel costs, dust recovery, and space requirements are predicted. The principal innovations in this process are pelletization, drying, and partial calcination of the raw mix before it enters the kiln for final burning. Reportedly, dust from the kiln is greatly reduced, a shorter kiln is used, and fuel is saved. The second plant, that of Universal Atlas Cement Co., of New York, also in Milwaukee, will grind cement clinker shipped from Buffington Cement Harbor, Lake County, Ind.

Total shipments of cement, and value thereof, decreased slightly below those in 1955. The average mill value per barrel in 1956 was $2.98 compared with $2.89 in 1955.

**Clays.**—Miscellaneous clay for manufacturing cement and heavy clay products was produced by eight companies from pits in Brown, Dunn, Fond du Lac, La Crosse, Manitowoc, Marathon, Racine, and Waupaca Counties. The total value of clays produced in 1956 increased over 1955.

**Lime.**—(Total shipments and value of quick and hydrated lime increased in 1956.) During the year 8 lime plants were operated by 5 companies in Brown, Calumet, Dodge, Douglas, Fond du Lac, and Manitowoc Counties. Over 73 percent of the total production was for chemical and industrial uses, such as insecticides, metallurgy, water purification, sewage treatment, paper manufacture, and polishing compounds. Approximately 24 percent was for building uses, including masonry mortar and finishing lime. The remainder was for agricultural use. Average value per ton of lime sold in Wisconsin in 1956 was $14.70 compared with $13.13 in 1955.

**Marl, Calcareous.**—Production of marl decreased substantially in 1956 compared with 1955. Output was reported by seven operators in Portage, Waupaca, and Waushara Counties. Sales in 1956 were for agricultural use. The average value per ton of marl sold in 1956 was $0.51 compared with $0.52 in 1955.

**Perlite.**—No crude perlite was produced in Wisconsin in 1956. However, crude perlite produced in Colorado was expanded at plants in Milwaukee and Outagamie Counties, chiefly for lightweight aggregate in plaster and concrete.

**Pyrite Sinter.**—Vinegar Hill Zinc Co. of Platteville shipped pyrite sinter for use in cement. The pyrite sinter was produced at the company sulfuric acid plant during World War II and shortly thereafter. The 1956 shipments nearly exhausted the accumulated stock.

**Sand and Gravel.**—The output of sand and gravel in Wisconsin in 1956, as in 1955, was approximately 28 million short tons. Production was reported from 57 of the 71 counties. Approximately 58 percent was produced at commercial and the remainder at Government-and-contractor operations. Wisconsin ranked eighth in the Nation in sand and gravel production in 1956.

About 72 percent of the sand and gravel output in Wisconsin in 1956 was used in building and paving. Substantial quantities were used for railroad ballast and molding purposes. Smaller quantities of special-type sands were consumed in sand blasting, engine use, filler, glass manufacture, and filter uses.

Approximately 88 percent of the quantity produced in the State was hauled by truck; the remainder was transported by rail and water.

The 10 leading commercial producers in 1956 listed alphabetically

Digitized by Google

were: Consumers Co., Racine; Hartland Sand & Gravel Co., Hartland; Jaeger Sand & Gravel Co., Inc., Milwaukee; Janesville Sand & Gravel Co., Janesville; Koepke Sand & Gravel Co., Appleton; Edw. Lutz Sand & Gravel, Milwaukee; F. F. Mengel Co., Wisconsin Rapids; Portage-Manley Sand Co., Rockton; A. J. Reiske Sons Co., Milwaukee; and Valley Sand & Gravel Co., Waukesha.

**TABLE 2.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses**

| | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average |
| COMMERCIAL OPERATIONS | | | | | | |
| Sand:[1] | | | | | | |
| Glass | 32,136 | $22,045 | $0.69 | 17,286 | $10,215 | $0.59 |
| Molding | 860,504 | 1,567,675 | 1.82 | 913,030 | 1,758,440 | 1.93 |
| Building | 2,500,203 | 1,920,510 | .77 | 2,489,064 | 2,051,064 | .82 |
| Engine | 491 | 736 | 1.50 | (2) | (2) | |
| Paving | 1,387,897 | 1,097,148 | .79 | 1,515,207 | 1,144,674 | .76 |
| Blast | 52,918 | 109,857 | 2.08 | (2) | (2) | |
| Filter | 55 | 260 | 4.73 | (2) | (2) | |
| Railroad ballast | 13,525 | 7,345 | .54 | (2) | (2) | |
| Filler | 4,065 | 2,033 | .50 | (2) | (2) | |
| Other | 752,725 | 371,269 | .49 | 685,677 | 411,284 | .60 |
| Undistributed[3] | | | | 144,714 | 203,596 | |
| Total sand | 5,604,519 | 5,098,878 | .91 | 5,764,978 | 5,579,273 | .97 |
| Gravel: | | | | | | |
| Building | 3,758,245 | 2,989,827 | .80 | 3,166,769 | 2,635,983 | .83 |
| Paving | 4,369,709 | 3,524,375 | .81 | 5,483,759 | 4,173,792 | .76 |
| Railroad ballast | 984,750 | 465,116 | .47 | 821,067 | 413,587 | .50 |
| Other | 410,598 | 319,903 | .78 | 761,901 | 498,689 | .65 |
| Total gravel | 9,523,302 | 7,299,221 | .77 | 10,233,496 | 7,722,051 | .75 |
| Total sand and gravel | 15,127,821 | 12,398,099 | .82 | 15,998,474 | 13,301,324 | .83 |
| GOVERNMENT-AND-CONTRACTOR OPERATIONS | | | | | | |
| Sand: | | | | | | |
| Building | | | | 53,393 | 31,288 | .59 |
| Paving | 4,089,935 | 1,466,961 | .36 | 4,371,022 | 1,535,876 | .35 |
| Total sand | 4,089,935 | 1,466,961 | .36 | 4,424,415 | 1,567,164 | .35 |
| Gravel: | | | | | | |
| Building | 170,872 | 81,972 | .48 | 342,657 | 145,955 | .43 |
| Paving | 8,589,707 | 6,011,418 | .70 | 6,949,625 | 4,082,712 | .59 |
| Total gravel | 8,760,579 | 6,093,390 | .70 | 7,292,282 | 4,228,667 | .58 |
| Total sand and gravel | 12,850,514 | 7,560,351 | .59 | 11,716,697 | 5,795,831 | .49 |
| ALL OPERATIONS | | | | | | |
| Sand | 9,694,454 | 6,565,839 | .68 | 10,189,393 | 7,146,437 | .70 |
| Gravel | 18,283,881 | 13,392,611 | .73 | 17,525,778 | 11,950,718 | .68 |
| Grand total | 27,978,335 | 19,958,450 | .71 | 27,715,171 | 19,097,155 | .69 |

[1] Includes friable sandstone.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes blast, engine, filler, filter, grinding and polishing, and railroad-ballast sand (1956).

**Stone.**—Stone output in Wisconsin in 1956 included limestone, granite, sandstone and quartzite, basalt, and miscellaneous stone. Production in 1956 was more than 11 million short tons—1 million short tons less than in 1955.

Digitized by Google

Limestone is widely distributed throughout the State. Dimension limestone, for structural and architectural use, rubble, and flagging, was produced in Brown, Door, Fond du Lac, La Crosse, Manitowoc, Racine, Rock, Vernon, and Waukesha Counties. Crushed or broken limestone was produced in 39 counties in 1956. Output was chiefly for concrete aggregate and roadstone and agricultural, industrial, and chemical uses.

The 10 leading commercial producers of limestone in 1956 listed alphabetically were: Consumers Co., Racine; Courtney & Plummer, Inc., Neenah; Ray De Cleene's Stone Quarry, De Pere; Fond du Lac Stone Co., Fond du Lac; Franklin Stone Products, Milwaukee; Halquist Lannon Stone Co., Sussex; Edward Kraemer & Sons, Plain; Milwaukee Limestone Products Co., Milwaukee; Quality Limestone Products, Inc., Sussex; and Waukesha Lime & Stone Co., Inc., Waukesha.

**TABLE 3.—Limestone sold or used by producers in 1955–56, by uses [1]**

| Use | 1955 | | | 1956 | | |
|---|---|---|---|---|---|---|
| | Quantity | Value | | Quantity | Value | |
| | | Total | Average per unit of measure | | Total | Average per unit of measure |
| Dimension: | | | | | | |
| Rough construction, short tons | 5,185 | $23,961 | $4.62 | 6,004 | $75,154 | $12.52 |
| Rubble, do. | 11,607 | 41,299 | 3.56 | 9,311 | 29,713 | 3.19 |
| Rough architectural, cubic feet | 89,458 | 187,098 | 2.09 | 38,083 | 27,936 | .73 |
| Dressed (cut and sawed), do. | 547,219 | 1,121,259 | 2.05 | 844,731 | 1,444,120 | 1.71 |
| Flagging, do. | 51,608 | 51,441 | 1.00 | 108,595 | 127,579 | 1.17 |
| Total dimension equivalent short tons [2] | 71,855 | 1,425,058 | 19.83 | 94,628 | 1,704,502 | 18.01 |
| Crushed and broken: | | | | | | |
| Riprap, short tons | 36,573 | 47,677 | 1.30 | 112,254 | 110,642 | .99 |
| Flux, do. | (3) | (3) | (3) | (3) | (3) | (3) |
| Refractory, do. | 25,000 | 30,120 | 1.20 | | | |
| Concrete aggregate and roadstone, short tons | 9,935,936 | 9,263,502 | .93 | 8,224,587 | 8,305,414 | 1.01 |
| Railroad ballast, do. | 142,354 | 172,713 | 1.21 | 225,018 | 269,416 | 1.19 |
| Agriculture, do. | 886,536 | 1,257,112 | 1.42 | 1,090,045 | 1,472,126 | 1.35 |
| Other uses, do. | 321,937 | 399,161 | 1.24 | 346,800 | 431,484 | 1.24 |
| Total crushed and broken, short tons | 11,348,336 | 11,170,285 | .98 | 9,999,604 | 10,589,082 | 1.06 |
| Grand total, do. | 11,420,191 | 12,595,343 | 1.10 | 10,094,232 | 12,293,584 | 1.22 |

[1] Includes both commercial and Government-and-contractor production.
[2] Average weight of 160 pounds per cubic foot used to convert cubic feet to short tons.
[3] Included with "Other" to avoid disclosing individual company confidential data.

Dimension granite was produced by eight companies in Marathon, Marinette, Marquette, and Waushara Counties. Output was chiefly for building and monumental purposes. Crushed granite for concrete aggregate and other uses was produced in Waushara and Wood Counties.

Production of dimension sandstone was recorded in Dunn, Marathon, Waushara, and Wood Counties in 1956. Output was employed for flagging, rubble, and rough construction and as dressed stone.

Digitized by Google

Crushed sandstone and quartzite were produced in Marathon, Oconto, Sauk, and Wood Counties for abrasives, concrete aggregate, refractory stone, riprap, and roofing granules. Production of sandstone and quartzite in 1956 totaled 571,910 short tons valued at $5,196,785.

Crushed basalt was produced in Marinette and Polk Counties, chiefly for roofing granules, but also for concrete aggregate, riprap, railroad ballast, and filter rock.

A small quantity of miscellaneous stone for riprap was produced in St. Croix County in 1956. Output was from Government-and-contractor operations and totaled 3,046 short tons valued at $1,219.

## METALS

**Iron Ore.**—The prolonged midyear steel strike had an adverse effect on iron-ore shipments from Wisconsin in 1956. Although production was only slightly less than in 1955, iron-ore shipments decreased 21 percent. Steel production declined from 93 percent of average rated ingot capacity in 1955 to 89.8 percent in 1956.

Three companies again accounted for the entire output of the State. On the Gogebic range in Iron County, Oglebay, Norton & Co. and Pickands Mather & Co. operated underground at the Montreal mine and Cary mine, respectively. On the Menominee range in Florence County Zontelli Bros., Inc., operated the Meress open-pit mine.

Stocks of iron ore at Wisconsin mines totaled 99,430 long tons at the beginning of 1956. Production during the year exceeded shipments by 63,077 long tons; thus year-end stocks were 162,507 long tons. Excluding 294 tons of concentrate, all ore produced in 1956 was of direct shipping grade.

**TABLE 4.—Iron-ore production and shipments, 1952–56**

| Year | Number of mines | Production (long tons) | Shipments (long tons) | Iron content of shipments natural (percent) |
|---|---|---|---|---|
| 1952 | 2 | 1,495,109 | 1,485,845 | 52.56 |
| 1953 | 3 | 1,756,150 | 1,655,331 | 52.48 |
| 1954 | 2 | 1,491,470 | 1,428,910 | 52.81 |
| 1955 | 3 | 1,588,523 | 1,886,029 | 52.03 |
| 1956 | 3 | 1,551,438 | 1,488,361 | 52.49 |

Most of the iron ore shipped from Wisconsin mines in 1956 went by rail to ore docks at Ashland, Wis., and Escanaba, Mich., then by water to lower Lake ports. About 4 percent was shipped entirely by rail to consuming centers.

Throughout 1956 Lake Erie base prices of iron ore per long ton were: High Phosphorus, $10.85; Mesabi Non-Bessemer, $10.85; Mesabi Bessemer and Old Range Non-Bessemer, $11.00 and Old Range Bessemer, $11.25. These prices include transportation costs from the mines to lower Lake ports. Transportation costs are not included in the total value of mineral output in Wisconsin. The base prices are established for ores containing 51.5 percent iron (natural) and, for Bessemer ores, less than 0.045 percent phosphorus (dry). Ores with more than 0.18 percent phosphorus (dry) are classed as High Phos-

Digitized by Google

phorus. Variations in grade and physical structure call for premiums or penalties.

Preliminary drilling, sampling, and testing of iron-bearing material in areas of high anomalies in Ashland County indicated sizable iron formations that may be a source of low-grade iron ore for large-scale mining and beneficiation.

**Lead and Zinc.**—The 1956 output in Wisconsin of 2,582 tons of lead and 23,890 tons of zinc (in terms of recoverable metal) was the largest in nearly 3 decades and represented increases of 33 and 30 percent, respectively, over the 1955 figures of 1,948 tons of lead and 18,326 tons of zinc. Adequate and stable prices and sustained demand were important factors in the gain. Except for a few days in the first week of 1956, prices for lead and zinc remained steady throughout the year at 16 and 13.5 cents per pound, respectively. All production was from southwestern Wisconsin in Grant, Iowa, and Lafayette Counties.

Active operations numbered 14 lode mines and 5 tailing dumps. The leading producers were: American Zinc, Lead & Smelting Co., (Vinegar Hill Division), Eagle-Picher Co., Ivey Construction Co., and Piquette Mining & Milling Co. Drifting totaled 1,594 feet and churn drilling 16,686 feet. Aerial electromagnetic surveys were conducted in the Plattsville area, but no new discoveries were publicized.

**TABLE 5.—Mine production of lead and zinc, 1947–51 (average) and 1952–56, in terms of recoverable metals**

| | Mines producing | | Material treated | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|
| | Lode | Tailings | Ore (short tons) | Tailings[1] (short tons) | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 33 | 2 | 254,389 | 61,531 | 961 | $307,957 | 9,372 | $2,744,539 | $3,052,496 |
| 1952 | 24 | 10 | 670,332 | 82,146 | 2,000 | 644,000 | 20,588 | 6,835,216 | 7,479,216 |
| 1953 | 29 | 3 | 534,882 | 19,133 | 2,094 | 548,628 | 16,830 | 3,870,900 | 4,419,528 |
| 1954 | 7 | 11 | 523,755 | 39,799 | 1,261 | 345,514 | 15,534 | 3,355,344 | 3,700,858 |
| 1955 | 10 | 5 | 583,731 | 31,831 | 1,948 | 580,504 | 18,326 | 4,508,196 | 5,088,700 |
| 1956 | 14 | 5 | 828,579 | 139,346 | 2,582 | 810,748 | 23,890 | 6,545,860 | 7,356,608 |

[1] Partly estimated.

**TABLE 6.—Mine production of lead and zinc in 1956, by months, in terms of recoverable metals, in short tons**

| Month | Lead | Zinc | Month | Lead | Zinc |
|---|---|---|---|---|---|
| January | 210 | 1,515 | August | 220 | 2,255 |
| February | 280 | 1,925 | September | 185 | 2,155 |
| March | 240 | 2,030 | October | 260 | 2,300 |
| April | 240 | 1,960 | November | 205 | 2,035 |
| May | 250 | 2,055 | December | 192 | 2,085 |
| June | 120 | 1,660 | | | |
| July | 180 | 1,915 | Total | 2,582 | 23,890 |

## REVIEW BY COUNTIES

**Adams.**—Gravel for building and road construction was produced in the county by A. T. Riese, at a portable plant near Wisconsin Dells.

**Barron.**—Clyde Lilly (Poskin) produced sand and gravel for building and road construction. The county agricultural commission produced crushed limestone for agricultural use.

Digitized by Google

**TABLE 7.—Value of mineral production in Wisconsin, 1955–56, by counties [1]**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Adams | (2) | (2) | Sand and gravel. |
| Ashland | (2) | | |
| Barron | $240,758 | (2) | Stone, sand and gravel. |
| Brown | 1,044,906 | $932,160 | Sand and gravel, lime, stone, clays. |
| Buffalo | 230,893 | 164,697 | Stone. |
| Burnett | 47,950 | 47,464 | Sand and gravel. |
| Calumet | 88,480 | 104,790 | Sand and gravel, stone, lime. |
| Chippewa | 67,458 | 12,375 | Sand and gravel. |
| Clark | 145,912 | 139,905 | Do. |
| Columbia | 1,311,519 | (2) | Sand and gravel, stone. |
| Crawford | 160,263 | 81,014 | Stone, sand and gravel. |
| Dane | 3,646,765 | 1,252,801 | Sand and gravel, stone. |
| Dodge | 653,103 | 735,146 | Lime, sand and gravel, stone. |
| Door | 201,873 | 129,596 | Sand and gravel, stone. |
| Douglas | (2) | (2) | Lime, sand and gravel. |
| Dunn | 38,503 | (2) | Sand and gravel, clays, stone. |
| Florence | (2) | (2) | Iron ore. |
| Fond du Lac | 777,544 | 992,725 | Stone, sand and gravel, lime, clays. |
| Forest | 69,244 | 48,151 | Sand and gravel. |
| Grant | 963,312 | 1,855,685 | Zinc, stone, lead, sand and gravel. |
| Green | 392,638 | 379,873 | Stone, sand and gravel. |
| Green Lake | 519,881 | 473,818 | Sand and gravel. |
| Iowa | 261,367 | 916,278 | Zinc, stone, lead, sand and gravel. |
| Iron | (2) | (2) | Iron ore, stone, sand and gravel. |
| Jackson | 17,904 | 27,777 | Sand and gravel. |
| Jefferson | 108,016 | 135,748 | Do. |
| Juneau | 124,632 | 85,091 | Stone, sand and gravel. |
| Kenosha | 180,142 | 151,246 | Sand and gravel. |
| Kewaunee | (2) | | |
| La Crosse | 131,657 | 133,291 | Stone, sand and gravel, clays. |
| Lafayette | 4,572,435 | 5,374,963 | Zinc, lead, sand and gravel, stone. |
| Langlade | 129,973 | 141,540 | Sand and gravel. |
| Lincoln | (2) | 92,684 | Do. |
| Manitowoc | 6,225,176 | 6,616,324 | Cement, sand and gravel, lime, clays, stone. |
| Marathon | 5,072,452 | 4,782,256 | Stone, sand and gravel, clays. |
| Marinette | (2) | (2) | Stone. |
| Marquette | 212,764 | (2) | Stone, sand and gravel. |
| Milwaukee | 1,447,599 | 1,768,056 | Do. |
| Monroe | 67,103 | 146,442 | Stone. |
| Oconto | 210,606 | 227,202 | Sand and gravel, stone. |
| Oneida | 110,147 | 160,338 | Sand and gravel. |
| Outagamie | 395,850 | 426,786 | Sand and gravel, stone. |
| Ozaukee | 262,773 | 283,953 | Sand and gravel. |
| Pepin | 17,219 | (2) | Stone. |
| Pierce | 253,985 | 368,160 | Sand and gravel, stone. |
| Polk | 341,028 | 567,562 | Stone, sand and gravel. |
| Portage | 306,532 | (2) | Sand and gravel, marl. |
| Price | 16,335 | 4,713 | Sand and gravel. |
| Racine | (2) | (2) | Stone, sand and gravel, clays. |
| Richland | (2) | (2) | Stone. |
| Rock | 1,329,687 | 1,349,234 | Sand and gravel, stone. |
| Rusk | 64,641 | 91,165 | Sand and gravel. |
| St. Croix | 449,390 | 348,668 | Sand and gravel, stone. |
| Sauk | 1,590,790 | 2,290,910 | Stone, sand and gravel, abrasives. |
| Sawyer | 67,201 | 43,444 | Sand and gravel. |
| Shawano | 248,386 | 346,603 | Sand and gravel, stone. |
| Sheboygan | 396,792 | 301,943 | Do. |
| Taylor | (2) | (2) | Sand and gravel. |
| Trempealeau | 140,189 | 139,774 | Stone. |
| Vernon | 454,731 | (2) | Stone, sand and gravel. |
| Vilas | 44,798 | 42,324 | Sand and gravel, stone. |
| Walworth | 229,357 | 285,405 | Do. |
| Washburn | 863 | | |
| Washington | 837,460 | 659,260 | Sand and gravel, stone. |
| Waukesha | 4,940,994 | 5,347,862 | Do. |
| Waupaca | (2) | (2) | Stone, sand and gravel, clays, marl. |
| Waushara | 30,030 | (2) | Stone, marl. |
| Winnebago | 1,425,720 | 1,803,948 | Sand and gravel, stone. |
| Wood | 22,323 | 151,191 | Stone. |
| Undistributed [3] | 22,473,449 | 23,552,872 | |
| Total | 65,813,000 | [4]65,860,000 | |

[1] Bayfield and Eau Claire Counties are not listed because no production was reported.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes sand and gravel and stone that cannot be assigned to specific counties, and values indicated by footnote 2.
[4] Total adjusted to eliminate duplicating value of clays and stone.

Digitized by Google

**Brown.**—Clay for heavy clay products was produced by Duck Creek Brick Co. and Hockers Bros. Brick & Tile Co. (Green Bay).

Quicklime and hydrated lime were produced by the Western Lime & Cement Co., Milwaukee, at its Green Bay plant. The plant has five shaft kilns and a batch-type hydrator. Sales were for chemical and industrial uses.

The bulk of the sand and gravel output of the county, was used for building and road construction. Sand was produced for glass and "Other" uses and gravel for railroad ballast. Producers in 1956 included Daanen & Janssen, De Pere; Alvin Destree, O. K. Sand & Gravel Co., Schuster Construction Co., Allard & Van Nelson, and Frank Van Nelson, Green Bay; Ed Kocken, West De Pere; Peters Trucking Co., Suamico; W. B. Sheedy Construction Co., Pulaski; and Wm. Winkler & Sons Construction Co., Greenleaf.

Daanen & Janssen (De Pere) crushed limestone for concrete aggregate. Ray De Cleene's Stone Quarry and the Scray Quarry (De Pere) reported output of dimension and crushed limestone for rough architectural use, flagging, house stone veneer, rubble, and concrete aggregate.

**Buffalo.**—Crushed limestone for agricultural purposes and concrete aggregate was produced by H. E. Kochenderfer, Cochrane; Edward Kraemer & Sons, Plain; and Neuheisel Lime Works, Eau Claire, near Mondovi.

**Burnett.**—Sand and gravel was produced by the county highway department for road construction.

**Calumet.**—The Western Lime & Cement Co. (Milwaukee) produced quicklime and hydrated lime at its High Cliff plant near Sherwood. The plant has three shaft kilns and a batch-type hydrator. Sales were chiefly for building and agricultural purposes. The company produced crushed limestone from its High Cliff quarry for use in its lime plant and as concrete aggregate.

Output of sand and gravel for building and road construction and gravel for railroad ballast was reported by Arnold M. Ortlepp, Chilton; and Quality Sand & Gravel Co., Wrightstown, near Brillion. The county highway commission crushed limestone and produced gravel for concrete aggregate and road construction.

**Chippewa.**—Chippewa Sand & Gravel Co. produced building sand and gravel near Chippewa Falls.

**Clark.**—Paul Bros. (Owen) and Plautz Bros. Sand & Gravel Co. (Willard, near Greenwood) produced sand and gravel for building, road construction, and other uses. The county highway department produced and contracted for sand and gravel for road construction.

**Columbia.**—Sand for molding use was produced by Francis James, Doylestown; and Portage-Manley Sand Co., of Rockton, near Portage. The county highway commission produced road-construction gravel.

Dann & Wendt (Rio) operating the De Puy quarry, crushed stone for agricultural purposes and concrete aggregate.

**Crawford.**—Building sand and gravel was produced near Prairie du Chien by Prairie Sand & Gravel Co. Glass sand and building gravel was produced by Frank Mezera (Eastman, near Prairie du Chien).

Limestone for agricultural use and concrete aggregate was reported by Edward Kraemer & Sons, Plain; Ward & Monroe, Steuben; and Loren J. Slaght, Eastman, at the Pomerening quarry.

Digitized by Google

**Dane.**—Sand and gravel was produced in Dane County chiefly for building and road construction. Operators reporting output in 1956 were as follows: Boehnen, Inc., Cross Plains; Capital Sand & Gravel Corp., Madison Sand & Gravel Co., Rein & Schultz, Inc., Speedway Sand & Gravel Co., and Stewart Watson Construction Co., Madison; General Silica Co., Milwaukee, near Mount Horeb; Harltand-Verona Gravel Co., Verona; Charles Langer & Son, Waterloo; Rein & Dahl, Inc., and Sundby Sand & Gravel Co., Stoughton; August Shemanek, Black Earth; George Wendtlandt, Mineral Point, near Mount Horeb; and the county highway department. Commercial producers of crushed limestone for agricultural use, concrete aggregate, railroad ballast, and riprap were: Baumgardt Construction Co., Dodgeville; Boehnen, Inc., Cross Plains; Raemisch Quarry, Madison, near Verona; Stewart Watson, of Madison, near Mount Horeb; Alva Brumm, Hammersley Stone Co., Madison Stone Co., Inc., and Wingra Stone Co., Madison; Carpenters Quarry, Cambridge; Kuhnau & Hosig Bros., Spring Green, near Roxbury; and Quan & Kaupanger, Stoughton.

**Dodge.**—Western Lime & Cement Co. operated its lime plant at Knowles and sold hydrated lime for agricultural, building, chemical, and industrial uses. The plant has five shaft kilns and 1 batch- and 1 continuous-type hydrator. Mayville White Lime Works produced quicklime at Mayville for building, chemical, and industrial uses. The company had two shaft kilns at its plant. Both companies quarried limestone for agricultural purposes, concrete aggregate, flux, lime, mineral food, riprap, and other uses. Melvin Voigt (Ashippun) was credited with gravel for building and road construction. Sand and gravel for road construction was produced by and for the county highway commission.

**Door.**—Adamski & Fischer Quarry (Sturgeon Bay) produced dimension limestone for flagging and house stone veneer. The county highway department crushed limestone and gravel for concrete aggregate and road construction.

**Douglas.**—Cutler-Laliberte-McDougall Corp., at Superior, sold quicklime for building, chemical, and industrial uses. The company has two rotary kilns at the plant.

Sand and gravel for road construction was produced by the city engineer, Superior, and the county highway department.

**Dunn.**—Menomonie Brick Co. (Menomonie) mined clay for heavy clay products.

Red Cedar Sand & Gravel Co. reported sand and gravel produced for building and other uses at its plant near Menomonie.

Output of dimension sandstone for dressed stone and rubble was reported by the Downsville Cut Stone Co., Downsville.

**Florence.**—Iron ore was shipped from the Meress mine by Zontelli Bros., Inc. (Ironton, Minn.). The mine is an open pit near Florence in the Menominee range.

**Fond du Lac.**—Miscellaneous clay for heavy clay products was produced by Oakfield Shale Brick & Tile Co.

Western Lime & Cement Co. (Milwaukee) produced quicklime and hydrated lime at its Eden plant for building, agricultural, chemical, and industrial uses. The plant has five shaft kilns and a continuous-type hydrator. The company operated a limestone quarry nearby, and produced crushed limestone for lime and paper mills.

Digitized by Google

Sand and gravel, chiefly for building and road construction, was produced by Lake View Sand & Gravel Co., Fond du Lac, near Peebles; M. A. Leiberg, Oakfield; Schroeder Bros. Sand & Gravel, Kiel, near St. Cloud; and the county highway department.

Dimension limestone was produced in the county for cut stone, flagging, stone veneer, rough architectural use, construction, and sawed stone. Crushed stone was produced for agricultural purposes, concrete aggregate, and other uses. Producers in 1956 were Fond du Lac Stone Co. and Hamilton Stone Co., Fond du Lac; Edward Kraemer & Sons, Plain; and Nellis Limestone Quarry, Inc., Ripon.

**Forest.**—Gravel for railroad ballast was produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad. The county highway department produced road gravel.

**Grant.**—Lead, sand and gravel, stone, and zinc were produced in Grant County in 1956.

Lead and zinc were produced by the Piquette Mining & Milling Co. (St. Louis, Mo.) at the Piquette No. 2 mine. A small quantity of zinc concentrate was produced by the P. V. C. Mining Co. (Platteville).

Pyrite sinter was shipped by Vinegar Hill Zinc Co. (Platteville).

Becker & Tuckwood (Lancaster, near Cassville), George Wendtlandt (Mineral Point), and the county highway department produced sand and gravel for building and road construction.

Crushed limestone for agricultural purposes, concrete aggregate, and railroad ballast was produced by Becker & Tuckwood, Lancaster; Dell Needham, Fennimore; Piquette Mining & Milling Co. (St. Louis, Mo.), Potosi; E. C. Schroeder Co., Inc. (McGregor, Iowa), at the C. B. & Q. R.R. quarry at Wyalusing; Loren J. Slaght, Prairie du Chien, at the Millville quarry; George Wendtlandt, Mineral Point; Zenz & Sturmer, Bloomington; and the county highway commission.

**Green.**—Output of sand and gravel for building, road construction, and other uses was reported by Henry Altmann and Green County Sand & Gravel Co., Inc. (Monroe). The county highway commission produced and contracted for sand and gravel for road construction.

Crushed stone for agricultural use and concrete aggregate was reported by Rees Construction Co., Ted Stauffacher, Monroe; and P. W. Ryan Sons, Janesville.

**Green Lake.**—Output of sand, chiefly for molding, glass manufacture, and building, and gravel for building and road construction was reported in the county in 1956. Producers included Kolpin & Peterson Gravel Co., C. A. Chier Sand Co., Edward Chier, Chier St. Marie Co., F. B. Dubberstein & Sons, Inc., and A. F. Gelher Co., Inc., all of Berling; Fox Valley Sand & Gravel, Ripon, near Manchester; Kopplin & Kinas Co., Inc., Green Lake; Clifford Maginnis, Dalton; and Paul Polenska & Son, Manchester.

**Iowa.**—Lead and zinc concentrates were produced by Eagle-Picher Co. (Miami, Okla.) from the Linden mine and Ivey Construction Co. (Mineral Point) from the Graysville mine. Output of zinc concentrate was also reported from the Cocker mine by Miffin Mining Co., Inc. (Boscobel).

George Wendtlandt (Mineral Point) operating at various locations, reported gravel for road construction. Ivey Construction Co.,

Digitized by Google

George Wendtlandt (Mineral Point), Wonn & Martin (Cobb), and the county highway commission crushed limestone for agricultural use and concrete aggregate.

**Iron.**—Iron ore was produced by Oglebay Norton & Co. and Pickands Mather & Co., which operated the Montreal and Cary mines. Both mines are underground, in the Gogebic iron range. Output from the Montreal mine, which has produced for 50 years, was the lowest in 10 years.

The county highway department produced gravel for road construction.

Edward Kraemer & Sons (Plain) crushed limestone for concrete aggregate.

**Jackson.**—Chas. Marek, Sr. (Merrillan) and H. T. Smith (Hixton), both operating near Black River Falls, produced sand and gravel for building and road construction.

**Jefferson.**—Sand and gravel for building, road construction, and other uses was credited to Evenson & Rude, Cambridge; Hausz Bros., Fort Atkinson; and the county highway commission.

**Juneau.**—The county highway commission crushed stone for concrete aggregate and produced and contracted for road-construction sand and gravel.

**Kenosha.**—Building and road-construction sand and gravel was produced in the county by Bloss Sand & Gravel, Salem; Sam Sorenson, Woodworth; and the director of parks, Kenosha.

**La Crosse.**—The Meir Brick Co. mined clay from the George Schmitz property near La Crosse for heavy clay products.

Kammel-Smith Sand & Gravel Co. (La Crosse) produced sand and gravel for building. The county highway department produced sand for building and road construction.

The county highway department crushed stone for concrete aggregate.

**Lafayette.**—Mineral products of the county in 1956 were lead, sand and gravel, stone, and zinc.

The leading producer of both lead and zinc in the State was Eagle-Picher Co. The company produced lead and zinc from the Shullsburg and Winskell mines and zinc ore from the Birkett-Bastian-Andrews mine. Vinegar Hill Division, American Zinc, Lead & Smelting Co., produced lead and zinc ore from the Blackstone, Coulthard, Hancock, and Temperly mines. The Temperly mine began production in 1956. Other producers of zinc and/or lead in 1956 included Murray & Richards, John Schroeder Mining Co., Southwestern Wisconsin Mining Co., Blue Jay Mining Co., C. F. Witters, New Teasdale Mining Co., and Little Five Mining Co.

George Wendtlandt crushed stone for agricultural use and produced gravel for road use from several pits in the county.

**Langlade.**—Duffek Sand & Gravel, Inc., operating a sand and gravel plant near Antigo, reported output for building and road construction. The county highway department produced sand and gravel for road use.

**Lincoln.**—Merrill Gravel & Construction Co. produced sand and gravel for building and other uses and the county highway department produced gravel for road use.

Digitized by Google

**Manitowoc.**—The Manitowoc Portland Cement Co. produced portland cement at Manitowoc. The company operated 4 kilns ranging in length from 160 to 350 feet and all 10 feet in diameter. The company also produced clay, which it used in cement.

Quicklime and hydrated lime were credited to the Rockwell Lime Co. for building, chemical, and industrial uses. The company has one rotary kiln and a batch-type hydrator at its plant The company cushed limestone for agricultural purposes, concrete aggregate, and lime. Valders Lime & Stone Co. produced quicklime for building and agricultural purposes. The company plant has five shaft kilns. Dimension limestone was produced for rubble, rough architectural stone, cut stone, and house stone veneer and crushed stone for riprap and concrete aggregate.

Output of sand and gravel for building, road construction, and other uses was reported by R. & J. Fricke Co., Kasper Construction Co., and Fred Radandt Sons, at plants Nos. 1 and 2, all of Manitowoc; Norman Schema, Schroeder Bros. Sand & Gravel, Kiel; the city of Manitowoc; and the county highway department.

R. & J. Fricke Co. and the city of Manitowoc produced limestone for concrete aggregate.

**Marathon.**—Clay, granite, sand and gravel, and sandstone were produced in the county in 1956.

Marshfield Brick & Tile Co (Marshfield) mined clay for heavy clay products.

Producers of granite in the county in 1956 for monumental and architectural use included Anderson Bros. & Johnson Co., Cold Spring Granite Co., Lake Wausau Granite Co., Prehn Granite Quarries, Inc., and Red Wausau Granite Co.

Output of sand and gravel for building, railroad ballast, road construction, and other uses were reported by Mrs. John Gesicki, Sr., and Mike Wisnewski, Edgar; Lotz Sand & Gravel Co., and Riverside Gravel Co., Wausau.

Ellis Quarries, Inc. (Stevens Point), and Minnesota Mining & Mfg. Co. (St. Paul) produced dimension sandstone for rubble, dressed stone, and flagging and crushed stone for abrasives, riprap, and other uses.

**Marinette.**—Central Commercial Co. (Chicago, Ill.), crushed basalt near Pembine for roofing granules.

E. A. Mundt Granite Co. produced rough granite near Marinette for monumental use.

**Marquette.**—Dimension granite for monumental purposes was produced by Montello Granite Co. Edward Kraemer & Sons (Plain), crushed stone for concrete aggregate.

The county highway department produced gravel for road construction.

**Milwaukee.**—Output of filter sand and sand and gravel for building, road construction, railroad ballast, and other uses was reported by Ray Anderson Sand & Gravel Co., Moritz Sand & Gravel, and Sweeney Sand & Gravel Corp., all of Hales Corners, and Fink Sand & Gravel, Emma Kleist, Merget Sand & Gravel, A. J. Reiske Sons Co., Walter W. Rowe Sand & Gravel, and State Washed Sand & Gravel Co., Milwaukee.

Crushed limestone for use as concrete aggregate was produced by

Digitized by Google

Franklin Stone Products, Manegold Stone Co., Milwaukee Limestone Products Co., and Wauwatosa Stone Co., all of Milwaukee.

**Monroe.**—Ray Frings (Tomah), Otto Meyer (Sparta), and Schendel Bros. (Norwalk), crushed limestone for agricultural use and concrete aggregate.

**Oconto.**—Sand and gravel for road construction and other uses was produced by Belongia Construction Co., Oconto; Asa Foster, of Little Suamice, near Gillett; John Jaworski, Sobieski; and the county highway department.

The county highway department produced sandstone for concrete aggregate.

**Oneida.**—Dean B. Ekstrom, Musson Bros., Inc. (Rhinelander), Fox Valley Construction Co. (Appleton, near Minocqua), and the county highway department produced sand and gravel for building, road construction, and other uses.

**Outagamie.**—Sand and gravel for building, road construction, and other uses was produced by Landwehr & Hackl, Seymour; M. R. K. Construction Co., Inc., Kaukauna, near Seymour; and Sell Bros., Appleton.

Black Creek Limestone Co., Black Creek, and Landwehr & Hackl, Seymour, crushed limestone for agricultural use and concrete aggregate.

**Ozaukee.**—Kleist Sand & Gravel Co., Ozaukee Sand & Gravel Co. (Milwaukee, near Cedarburg), Muehlberg Gravel Co. (Port Washington), and the county highway department produced sand and gravel for building and road construction.

**Pepin.**—Edward Kraemer & Sons (Plain) and Neuheisel Lime Works (Eau Claire) crushed limestone for agricultural use and concrete aggregate.

**Pierce.**—Maiden Rock Silica Sand Co. produced blast sand near Maiden Rock. Bay City Sand Co., Inc. (Bay City) produced sand for blasting, grinding and polishing, engine, filter, molding, and other uses. Output of building sand and gravel was reported by River Falls Sand & Gravel Co. (River Falls). The county highway department produced sand and gravel for building and road construction.

Limestone for agricultural use and concrete aggregate was crushed by Baumgardt Construction Co., Dodgeville; Sanders Stone & Lime Co., Mount Horeb; and Pierce County Agricultural Stabilization & Conservation, Ellsworth.

**Polk.**—Output of crushed and broken basalt for concrete aggregate, railroad ballast, riprap, and other uses was reported by Dresser Trap Rock Co.

Jorgenson Construction Co. (Luck) and the county highway department produced sand and gravel for building, road construction, and other uses.

Polk County Agricultural Department (Balsam Lake) produced crushed limestone for agricultural and other uses.

**Portage.**—Clifford W. Caldwell (Waupaca) and Bert G. Somers Marl Excavator (Stevens Point) produced calcareous marl for agricultural use.

Output of sand and gravel for building, railroad ballast, road construction, and other uses was reported by F. F. Mengel Co., Wisconsin Rapids, near Custer; Gilford Wimme, Stevens Point; and the county highway department.

Digitized by Google

**Price.**—The Minneapolis, St. Paul & Sault Ste. Marie Railroad produced gravel for railroad ballast.

**Racine.**—The county highway commission crushed basalt for rough construction use.

Clay for heavy clay products and foundries was produced by Union Grove Drain & Tile Co.

Hillside Sand & Gravel Co. (Racine) and the county highway department produced sand and gravel for road use.

Consumers Co. (Department 383, Racine) crushed stone for asphalt filler, agricultural use, concrete aggregate, flux, magnesia plants, railroad ballast, and riprap. The county highway commission produced stone for rough construction.

**Richland.**—Edward Kraemer & Sons (Plain) and the county highway commission crushed limestone for concrete aggregate.

**Rock.**—Sand and gravel producers in Rock County in 1956 included the following: Atlas Sand & Gravel Co. and Janesville Sand & Gravel Co., Janesville; Chicago, Milwaukee, St. Paul & Pacific Railroad Co., Chicago; Consumers Co., Department 387, of Chicago, near Beloit; Luety Bros., Beloit; Edgerton Sand & Gravel Co., Edgerton; William J. Kennedy & Son, Footville, near Janesville; and the county highway department. Output was used for building, railroad ballast, and road construction.

Dimension limestone used as rubble and crushed stone for agriculture, concrete aggregate, and riprap was produced by Frank Bros., Milton Junction; Little Limestone Co., Peter J. Roth, and P. W. Ryan Sons, Janesville; Quam & Kaupanger, Stoughton, near Clinton; and the county highway department.

**Rusk.**—The county highway department produced sand and gravel for road construction.

**St. Croix.**—Ground sand for filler and sand and gravel, chiefly for building and road construction, were produced by Casey Gravel Works, New Richmond; Ed J. Leary Construction Co., River Falls; and the county highway department.

Ed J. Leary Construction Co. (River Falls), Wilson Rock & Limestone Co. (Wilson), and Pierce County Stabilization & Conservation (Ellsworth) produced crushed stone for agricultural use and concrete aggregate. The county highway department produced crushed limestone and miscellaneous stone for riprap.

**Sauk.**—Quartzite for refractory use was produced by Baraboo Quartzite Co., General Refractories Co., and Harbison-Walker Refractories Co. The Baraboo Quartzite Co. also produced grinding pebbles and tube-mill liners.

Deppe Lumber Co. (Baraboo) produced road gravel, and the county highway commission produced and contracted for sand and gravel for road construction.

Limestone for agricultural purposes and concrete aggregate was produced by Edward Kraemer & Sons, Plain, and Matoushek Bros., Prairie du Sac.

**Sawyer.**—The county highway department produced sand and gravel for road construction.

**Shawano.**—Sand and gravel for building, road construction, and other uses was produced by Murphy Sand & Gravel, Bonduel; Riemer Sand & Gravel, Cecil; Loyal Weishoff, Clintonville; M. J. Zimmerman Construction Co., Shawano; and the county highway commission.

465877—58——81

Digitized by Google

Edward Kraemer & Sons (Plain), and the county agricultural committee (Shawano) produced limestone for concrete aggregate and agricultural purposes.

**Sheboygan.**—Sand and gravel producers in the county in 1956 were Cascade Sand & Gravel Co., Cascade; Crystal Lake Crushed Stone Co., Sheboygan; Elkhart Moraine Sand & Gravel Co. (of Elkhart), near Elkhart Lake and Glenbeulah; and the county highway department. Output was chiefly for building, railroad ballast, road construction, and other uses.

The county agricultural agent produced limestone for agricultural purposes and concrete aggregate.

**Taylor.**—Zenether Bros. & Haenel (Westboro), produced gravel for road construction.

**Trempealeau.**—Limestone for agricultural use, concrete aggregate, and riprap was produced by Neuheisel Lime Works, Eau Claire; and Clarence Weiss, La Crosse.

**Vernon.**—Crushed limestone, chiefly for agricultural use and concrete aggregate, was produced by Ellefson Bros., Viroqua; and Edward Kraemer & Sons, Plain. The county highway commission produced dimension limestone for rough construction and rubble and sand for road construction.

**Vilas.**—The Chicago & Northwestern Railway Co. produced gravel for railroad ballast. Road-construction gravel was produced by the county highway department.

Edward Kraemer & Sons (Plain), produced limestone for concrete aggregate.

**Walworth.**—Sand and gravel for building, road construction, and other uses was reported by B. R. Amon & Sons, Mann Bros. Sand & Gravel, Inc., Elkhorn; George Booth, Elmer Harness, Delavan; Delavan Sand & Gravel Co., Inc. (of Milwaukee), near Delavan; Lake Geneva Sand & Gravel Co., Fontana; R. W. Miller, Lake Geneva; and Leroy Stoflet & Sons, Inc., East Troy.

H. E. Wheeler (Elkhorn) crushed stone for agricultural purposes and concrete aggregate.

**Washington.**—Sand and gravel output in the county in 1956 was chiefly for building, railroad ballast, road construction, and other uses. Producers included John B. Jacklin, Richfield; Kleist Sand & Gravel Co. and Ozaukee Sand & Gravel Co., Milwaukee; Northern Sand & Gravel Co., Fred C. Schultz & Son, and West Bend Ready Mix, all of West Bend; O. & W. Gravel Co. (of Port Washington), Newburg; Palmer Crushing Corp., Slinger; Leroy Schmidt, Germantown; and the county highway commission.

The county highway commission also crushed limestone for concrete aggregate.

**Waukesha.**—Sand and gravel was produced in the county in 1956 for building, railroad ballast, road construction, and other uses. Operators who reported output in 1956 were Wm. Buege, Jaeger Sand & Gravel Co., Inc., Edw. Lutz Sand & Gravel Co., and Northwest Sand & Gravel Co., Milwaukee; Frank Clark & Sons, West Allis; Consumers Co. (Department 322, of Racine), near Oconomowoc; Hales Corners Gravel, Hales Corners; Hartland Sand & Gravel Co., Hartland; Kohler Bros. Sand & Gravel Co., and Valley Sand & Gravel Co., Waukesha; A. W. Nowatske, Mukwonago; Frank Pernat, Jr.,

Digitized by Google

and O. Earl Rolefson, Oconomowoc; Walter D. Pett, Eagle; H. Turner & Son, Boscobel; Vogt, Inc., Okauchee; and the county highway department.

Limestone was produced in the county for various uses. Dimension limestone for rough construction, dressed stone, flagging, and rubble was produced by the following operators in 1956: Conco Building Products, Inc., Fonda Lannon Stone Co., Joecks Bros. Stone Co., Johnson & Sons, Kinkler Bros. Lannon Stone Co., Meadow Hill Quarries, Inc., Midwest Lannon Stone Co., Weather Rock Lannon Stone Quarry, West Side Stone Co., White Rock Lannon Stone Co., and Wisconsin Lannon Stone Corp., all of Lannon; Dudovick Lannon Stone Co., Milwaukee; Halquist Lannon Stone Co. and Quality Limestone Products Co., Inc., Sussex; Holmes Stone Works, Perrens Quarry, and Waukesha Lime & Stone Co., Inc., Waukesha; Ideal Lannon Stone Co., Colgate; and Milwaukee Lannon Stone Co. and Sussex Lannon Corp., Pewaukee. Crushed and broken limestone was produced by Conco Building Products, Inc., and West Side Stone Co., Lannon; Halquist Lannon Stone Co. and Quality Limestone Products, Inc., Sussex; Milwaukee Lannon Stone Co., Pewaukee; and Waukesha Lime & Stone Co., Inc., Waukesha. Output was used chiefly for agriculture, asphalt filler, concrete aggregate, fertilizer, filters, flux, railroad ballast, and riprap.

**Waupaca.**—Hockers Brick Co. (New London) produced clay for heavy clay products.

Clifford W. Caldwell (Waupaca), operating at Stratton Lake, produced calcareous marl for agricultural use.

C. H. Peters (of Fremont, near Readfield) and Howard W. Waite (Clintonville) produced gravel for building and road construction and sand for other uses.

Limestone for agricultural use and concrete aggregate was produced by C. H. Peters (of Fremont) at Caladonia.

**Waushara.**—Calcareous marl for agricultural use was produced by Theodore Anderson, Wild Rose; Gaylord Dehling and William Edwards, Wautoma; Leo Hendricksen, Red Granite; and Thomas Lundberg, Coloma.

Lohrville Stone Co. (Lohrville) produced dimension granite for rough monumental use and rubble; crushed granite for concrete aggregate; and dimension sandstone for rough construction, dressed stone, and rubble.

**Winnebago.**—Sand and gravel for building, road construction, and other uses was produced by Courtney & Plummer, Neenah; Friedrich & Loots, Oshkosh; Koepke Sand & Gravel Co. and Schulz Sand & Gravel, Inc., Appleton; and the county highway department.

Output of crushed and broken limestone for agricultural use, asphalt filler, concrete aggregate, railroad ballast, and riprap was reported by Badger Highways Co., Inc., Menasha; The Consumers Co. (of Racine), Oshkosh; and Courtney & Plummer, Inc., Neenah.

**Wood.**—Ellis Quarries, Inc., Felix Klesmith (Stevens Point), and Tony Schmick (Wisconsin Rapids) produced dimension sandstone for dressed stone, flagging, rough construction, and rubble and crushed sandstone for riprap.

The county highway department crushed granite for other uses.

Digitized by Google

Digitized by Google

# The Mineral Industry of Wyoming

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States, Department of the Interior, and the State Geological Survey of Wyoming.

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker [1]

THE MINERALS produced in Wyoming in 1956 were valued at $316.9 million, a $19.1 million increase over 1955 and an alltime high for the State. A part of this gain resulted from the inclusion, for the first time, of a value for uranium production; however, the bulk of the increase was due to important increases in the value of the liquid fuels. The number of persons employed in the mineral industry reached 10,700, or 300 more than in 1955, and wages totaling $49.9 million were paid.

In 1956 mineral fuels was the dominant group among all minerals produced and supplied 88 percent of the total value. In this group petroleum was the most important and furnished 92 percent. Petroleum output rose 5 percent over 1955; natural gas and LP-gases increased 8 percent, and natural gasoline 21 percent. Coal output declined 13 percent from 1955.

The nonmetals group of minerals comprised 10 percent of the total value of all minerals. Total value of nonmetals was $31.8 million—only 6 percent greater than in 1955. The construction materials were hardest hit as the result of a temporarily decreasing demand for these products. Among the 12 nonmetals produced, gypsum declined 49 percent; pumice decreased 42 percent; sand and gravel, 1 percent; and sodium sulfate, 27 percent. Cement, clays, sodium carbonate, stone, and sulfur increased slightly; only phosphate rock gained significantly in output.

Metals constituted an extremely small part of mineral activity in the State. Iron ore furnished the greater part of value in metals, followed by uranium, gold, tungsten, copper, beryl, vanadium, and silver. Exploration and development of uranium properties were the principal activities in metals. In the intensified search for uranium, private drilling tripled that in 1955 and totaled more than 1.2 million feet. As a result of this and previous drilling, ore reserves for the State totaled 2.3 million tons at an average grade of 0.22 percent contained $U_3O_8$ —3.8 percent of the total United States reserve estimate.

---

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.



Digitized by Google

## TABLE 1.—Mineral production in Wyoming, 1955–56 [1]

| Mineral | 1955 | | 1956 | |
|---|---|---|---|---|
| | Short tons (unless otherwise stated) | Value | Short tons (unless otherwise stated) | Value |
| Clays | 1,035,560 | $10,923,521 | 1,053,452 | $11,831,981 |
| Coal | 2,926,593 | 11,845,252 | 2,553,380 | 9,920,177 |
| Copper (recoverable content of ores, etc.) | ---- | ---- | 3 | 2,550 |
| Feldspar long tons | ---- | ---- | 1,201 | 8,195 |
| Gem stones | [2] | 57,000 | [2] | 75,000 |
| Gold (recoverable content of ores, etc.) troy ounces | 52 | 1,820 | 762 | 26,670 |
| Gypsum | 22,373 | 89,493 | 11,380 | 45,521 |
| Iron ore (usable) long tons, gross weight | 748,831 | [3] | [3] | [3] |
| Natural gas million cubic feet | 77,819 | 6,615,000 | 84,398 | 7,258,000 |
| Natural-gas liquids: | | | | |
| LP-gases thousand gallons | 46,106 | 1,961,000 | 49,838 | 2,337,000 |
| Natural gasoline do | 40,290 | 2,775,000 | 48,859 | 3,160,000 |
| Petroleum (crude) thousand 42-gallon barrels | 99,483 | 239,750,000 | 104,830 | 255,785,000 |
| Phosphate rock long tons | 54,958 | 345,451 | 119,230 | 721,341 |
| Pumice | [3] | [3] | 45,517 | 37,859 |
| Sand and gravel | 3,952,119 | 3,977,677 | 3,904,000 | 2,935,500 |
| Silver (recoverable content of ores, etc.) troy ounces | 20 | 18 | 154 | 139 |
| Sodium carbonates | [3] | [3] | [4] 337,851 | [4] 8,345,000 |
| Stone | 1,303,399 | 2,033,800 | 1,332,866 | 2,076,282 |
| Sulfur, recovered elemental long tons | 120,697 | 3,206,353 | 121,161 | 3,214,428 |
| Tungsten 60-percent $WO_3$ basis | ---- | ---- | 2 | 6,500 |
| Uranium ore | [5] | [6] | 107,400 | 2,100,000 |
| Value of items that cannot be disclosed: Beryllium concentrate (1956), cement, sodium sulfate, vanadium (1956), and values indicated by footnote [3] | ---- | 14,982,945 | ---- | 7,830,922 |
| Total [7] | ---- | 297,752,000 | ---- | 316,897,000 |

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed".
[4] Includes crude and calcined trona.
[5] Figure not released by Atomic Energy Commission.
[6] Total has been adjusted to eliminate duplicating value of raw materials used in manufacturing cement.
[7] Figure excludes uranium as indicated in footnote reference 5.

## TABLE 2.—Average unit value of selected mineral commodities in Wyoming, 1955–56 [1]

| Commodity | 1955 | 1956 | Commodity | 1955 | 1956 |
|---|---|---|---|---|---|
| Clays short ton | $10.548 | $11.232 | Petroleum (crude) [3] 42-gallon barrel | $2.410 | $2.440 |
| Coal do | 4.047 | 3.885 | Sand and gravel short ton | 1.006 | .752 |
| Gold [2] troy ounce | 35.000 | 35.000 | Silver [4] troy ounce | .905+ | .905+ |
| Gypsum short ton | 4.000 | 4.000 | Stone short ton | 1.560 | 1.558 |
| Natural gas thousand cubic feet | .085 | .086 | Sulfur, recovered elemental long ton | 26.565 | 26.530 |
| Natural-gas liquids: | | | | | |
| LP-gases gallon | .043 | .047 | | | |
| Natural gasoline do | .069 | .065 | | | |

[1] Prices are based on average value f. o. b. mines or mills reported by the producers except as otherwise noted.
[2] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[3] Value at wells.
[4] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505.

Digitized by Google

**Defense Minerals Exploration Administration (DMEA) Program.**—The participation in exploration projects in search of reserves of strategic and critical minerals by the DMEA reached $173,200 in 1956 compared with $140,900 in 1955. Four contracts were signed in both years (all for uranium), with 75-percent Government participation in each case.

**New Plants and Important Developments.**—Construction of a coal-fired thermal-electric plant was started in midyear at Glenrock. Coal was to be obtained from deposits 15 miles north of Glenrock.

During 1956 in Wyoming the Green River basin was the center of gas-drilling activity, which furnished over half of the gas discoveries and three-fourths of the gas-development wells. The Pacific Northwest pipeline from the San Juan basin of New Mexico to the Pacific Northwest States and the Colorado Interstate Gas Co. 22-inch branch-line connection from east of Green River (Wyo.) to Denver (Colo.) were completed. In addition, the Big Piney area was connected to the Pacific Northwest system by a 10-inch feeder line.

A new plant that recovered natural-gas liquids at Newcastle during 1956 increased to 11 the number of facilities extracting LP-gases and natural gasoline from wet gas.

**TABLE 3.—DMEA contracts executed in 1956 [1]**

| County and contractor | Property | Contract | |
|---|---|---|---|
| | | Date | Total amount |
| *Fremont* | | | |
| Antelope Mines | Ray, Ames, and Ann claims | Sept. 20 | $48,460 |
| Charles M. Coleman & Associates | Clyde, Marsh, and Longport groups of claims. | Apr. 11 | 9,492 |
| Vitro Minerals Corp | George and Ver claims | June 14 | 64,816 |
| *Fremont and Natrona* | | | |
| Shoni Uranium Corp | Jackneese and Blackstone claims | Apr. 19 | 50,436 |
| Total | | | 173,204 |

[1] All contracts for uranium; Government participation, 75 percent.

In the petroleum industry, discovery of a productive zone in the Tensleep formation in the East Salt Creek field and production from the Phosphoria formation in the Torchlight field were important developments. The number of active petroleum refineries was reduced to 10 during the year because a plant at Glenrock was closed. San Francisco Chemical Co. announced construction of a new $750,000 phosphate-rock plant at Leefe—a highlight of the year in the nonmetal industry. A third shaft was sunk to a depth of 1,600 feet at the Westvaco trona mine of Intermountain Chemical Co. for use in augmenting the mine's ventilation system. This shaft will permit the company to proceed on a pillar-recovery program, which will nearly double the recovery of ore without greatly affecting the production rate. The Neiber Dome sulfur plant of Signal Oil & Gas Co. was also completed in 1956.

Digitized by Google

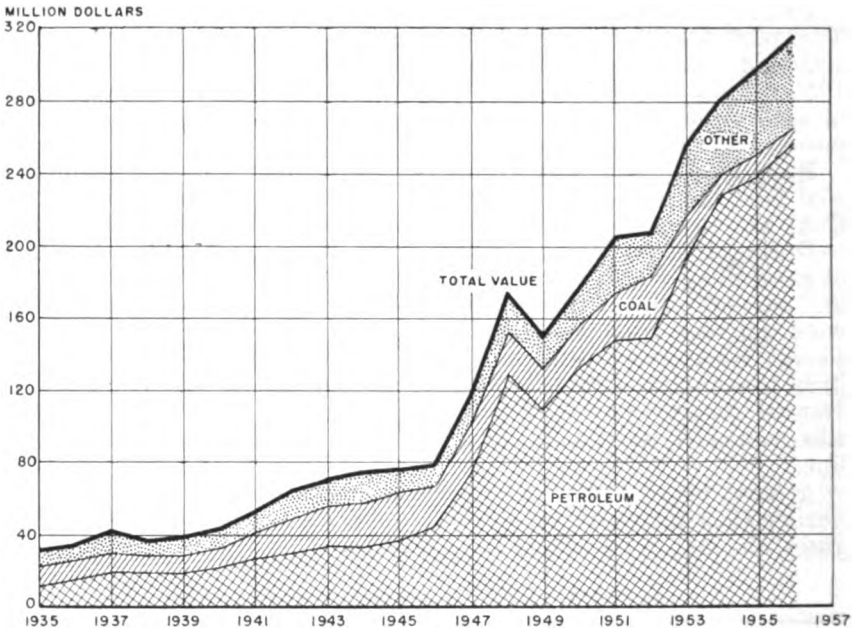



FIGURE 1.—Value of petroleum, coal, and total value of all minerals produced in Wyoming, 1935–56.

In metals, the Columbia-Geneva Steel Division of United States Steel Corp. signed contracts with independent companies for exploring and developing an iron-ore deposit in the South Pass area. The uranium ore-buying station of the Atomic Energy Commission (AEC) at Riverton was active throughout 1956, but purchases were restricted because plans for constructing a 400-ton-per-day mill at Split Rock and a 750-ton-per-day plant in the Gas Hills area were announced.

## EMPLOYMENT AND INJURIES

**Employment.**—Data in this section were procured from the Bureau of Labor Statistics, United States Department of Labor, and the Employment Security Commission of Wyoming. The term "mining" includes exploration and development of mineral properties, the removal of overburden, the extraction of minerals occurring naturally (including petroleum and natural gas), quarrying, well operation, and milling (crushing, screening, washing, flotation, etc.), and other preparation needed to render the material marketable.

Mining employment decreased from a high of 10,500 men in 1953 to 8,900 in 1955 and 8,700 in 1956. The principal cause for this decline was the reduction in the number of men engaged in coal mining. Had it not been for the discovery of uranium and subsequent exploration, development, and mining, as well as the increase in oil- and gas-well drilling during this period, the effect of the closing of so many coal mines would have adversely affected mining employment to a much greater extent.

Digitized by Google

TABLE 4.—Mining and contract construction employment in Wyoming, 1952–56

(In thousands)

[U. S. Department of Labor]

| | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Mining | 9.9 | 10.5 | 9.4 | 8.9 | 8.7 |
| Bituminous and other soft coal | 2.8 | 2.5 | 1.2 | .9 | .7 |
| Crude petroleum and natural gas | 6.1 | 6.7 | 7.0 | 6.7 | 6.5 |
| Other | 1.0 | 1.3 | 1.2 | 1.3 | 1.5 |
| Contract construction | 6.8 | 6.2 | 6.2 | 6.3 | 6.9 |

In discussing employment in mining in the State, consideration should be given to the contract construction category. This group includes engineering-project contractors who are engaged chiefly in constructing highways, streets, bridges, and tunnels, waterpower projects, sewer-disposal and drainage systems, airfields, and other heavy construction, which involves either the movement of large masses of earth or the quarrying of sand and gravel. As these contractors produced most of the sand and gravel, part of this group of men should be considered with mining employment. Exact figures on the number of men employed in the contract-construction industry and engaged in sand and gravel and stone quarrying are not available, but a 10- to 15-percent estimate would be reasonable. Data on men employed by general contractors in extracting sand and gravel were lacking because the labor force which produced this commodity was engaged only incidentally in quarrying and preparing sand and gravel. Accordingly, accurate records are not kept by the industry.

**Wages and hours.**—In 1956 the hourly rate for mine labor rose to $2.45 compared with $2.32 in 1955. Within this labor group bituminous- and other soft-coal workers received the largest increase—25 cents per hour compared with 13 cents for crude-petroleum and natural-gas employees and 6 cents for the other mining group. However, because of a shorter workweek average weekly earnings in the coal industry were the lowest of the mining group as a whole.

Wyoming workers in the coal and other mining groups worked fewer hours per week at a higher hourly rate than the average United States worker. On the other hand, employees in crude-petroleum and natural-gas industries worked more hours per week at a lower hourly rate than the United States average.

TABLE 5.—Hours and gross weekly earnings for mining employees in Wyoming 1955–56

[U. S. Department of Labor]

| | Average weekly hours | | Average hourly earnings | |
|---|---|---|---|---|
| | 1955 | 1956 | 1955 | 1956 |
| Production of petroleum and coal | 39.9 | 40.6 | $2.53 | $2.74 |
| Mining | 41.3 | 41.3 | 2.32 | 2.45 |
| Bituminous and other soft coal | 31.1 | 32.9 | 2.58 | 2.83 |
| Crude petroleum and natural gas | 43.6 | 42.6 | 2.31 | 2.44 |
| Other | 41.7 | 42.9 | 2.21 | 2.27 |
| Construction | 39.5 | 39.7 | 2.34 | 2.49 |

Digitized by Google

**Injuries.**—The State inspector of coal mines of Wyoming reported [2] that there were two fatalities in coal mines and none in noncoal mines. Also, the report shows that there were 25 nonfatal accidents at coal mines and 26 at noncoal mines. The two fatal accidents occurred during haulage operations. The classification of causes of nonfatal accidents was as follows: Haulage, 9; slipping and falling, 11; lifting, 2; flying and falling objects, 15; straining, 2; mechanical, 5; and miscellaneous, 7.

## REVIEW BY MINERAL COMMODITIES

### MINERAL FUELS

**Coal.**—Coal production from 23 active mines in 9 counties totaled 2.6 million tons and was 13 percent less than in the previous year. Continuing decline in output from mines in Sweetwater County supplied most of the loss in production. Decreases were reported from all counties in the State except Campbell and Lincoln. Output from 8 strip mines was 1.5 million tons—the same as in 1955.

Construction of a coal-fired thermal-electric plant was started in midyear at Glenrock, in Converse County. The plant (of 100,000-kilowatt capacity) was to be supplied with coal from strippable deposits 15 miles north of Glenrock.

**TABLE 6.—Production of coal, 1955–56, by counties**

(Exclusive of mines producing less than 1,000 tons)

| County | 1955 Short tons | 1955 Average value per ton [1] | 1956 Short tons | 1956 Average value per ton [1] |
|---|---|---|---|---|
| Campbell | 349,566 | $1.21 | 373,958 | $1.21 |
| Carbon | 192,493 | 3.54 | 164,003 | 3.88 |
| Converse | 8,040 | 3.37 | 6,608 | 3.26 |
| Fremont | 3,624 | 6.57 | 2,061 | 6.60 |
| Hot Springs | 17,442 | 6.94 | 16,425 | 7.69 |
| Johnson | 1,393 | 4.50 | 1,177 | 4.50 |
| Lincoln | 645,720 | 2.87 | 690,097 | 2.91 |
| Sheridan | 437,222 | 3.38 | 411,407 | 3.26 |
| Sweetwater | 1,271,093 | 5.69 | 887,644 | 5.99 |
| Total | 2,926,593 | 4.05 | 2,553,380 | 3.89 |

[1] Value received or charged for coal f. o. b. mine, including selling cost. (Includes value for coal not sold but used by producer, such as mine fuel and coal coked, as estimated by producer at average prices that might have been received if such coal had been sold commercially).

**Natural Gas.**—Marketed production of natural gas in 1956 was 84.4 billion cubic feet compared with 77.8 billion in the preceding year.

Major producing fields were the Worland (Washakie), Church Buttes (Uinta and Sweetwater), Salt Creek (Natrona), Beaver Creek (Fremont), Big Sand Draw (Fremont), and Baxter Basin (Sweetwater). Of a total of 75 gas-producing fields, these 6 yielded over half of the State output.

The Green River basin continued to be the center of gas-drilling activity; 7 of 12 gas discoveries and 30 of 40 gas-development wells were reported from the Basin area. Five of the discoveries were near the Baxter Basin fields of Sweetwater County; development

[2] Fearn, Lyman (State coal-mine inspector), Annual Report of the State Inspector of Coal Mines of Wyoming, Year Ending Dec. 31, 1956: 47 pp.

Digitized by Google

activity was concentrated in the Big Piney area of Sublette County.

The Pacific Northwest pipeline and the Colorado Interstate Gas Co. branch-line connection to Denver were completed in 1956. The Big Piney area was connected to the Pacific Northwest system in August by a 10-inch feeder line.

**Natural-Gas Liquids.**—Output of natural gasoline and liquefied-petroleum gases was 98.7 million gallons valued at $5.5 million. Ten plants were extracting natural-gas liquids at the beginning of 1956, and one new plant was placed in operation at Newcastle in Weston County during the year.

**Petroleum.**—Wyoming oilfields yielded 104.8 million barrels of crude petroleum in 1956, a 5-percent increase over the previous year. Most of the increased output came from fields of the Big Horn basin; the major decline in production was in the Clareton trend of Weston and Niobrara Counties.

Exploration activity resulted in 1.35 million feet of drilling (the same as in 1955), although the number of holes was greater—289 compared with 262 in 1955. Development activity contributed 2.67 million feet of drilling, compared with 3.13 million in the previous year.

Some of the important exploration results were discovery of production in the Tensleep formation in the East Salt Creek field of Natrona County and production from the Phosphoria formation in the Torchlight field in Big Horn County. Interest in the Donkey Creek area of southeastern Crook County was also considerably higher than in the previous years.

One of Wyoming's 11 refineries was closed in 1956. The Glenrock plant in Converse County was closed in January and was being gradually dismantled. The plant at Lovell in Big Horn County was closed at the end of April. The Big Horn Refining Co. acquired the Ohio Oil refinery at Lovell and operated it from October through December 1956.

**TABLE 7.—Production of crude petroleum, 1955–56, by counties**

[In thousand barrels]

| County | 1955 | 1956 | Leading fields in order of 1956 production |
|---|---|---|---|
| Albany | 505 | 436 | Quealy, Herrick, Little Laramie. |
| Big Horn | 12,570 | 12,804 | Bonanza, Garland, Byron. |
| Campbell | 3 | 7 | Bertha. |
| Carbon | 2,372 | 2,408 | Wertz, Rock River, Big Medicine Bow. |
| Converse | 6,468 | 6,275 | Glenrock-S, Big Muddy, Cole Creek-S. |
| Crook | 13 | 189 | Donkey Creek, Kara, Grasshopper Butte. |
| Fremont | 13,203 | 14,140 | Steamboat Butte, Big Sand Draw, Beaver Creek. |
| Goshen | 82 | 88 | Torrington. |
| Hot Springs | 13,620 | 14,396 | Hamilton Dome, Grass Creek, Gebo. |
| Johnson | 7,573 | 7,307 | Sussex, Meadow Creek, Sussex-W, Dugout. |
| Laramie | 384 | 468 | Horse Creek, Pine Bluffs, Borie. |
| Lincoln | 84 | 87 | La Barge. |
| Natrona | 6,161 | 7,234 | Salt Creek, Grieve Unit, Sage Spring Creek. |
| Niobrara | 1,845 | 1,684 | Lance Creek, Little Buck Creek, Mule Creek. |
| Park | 20,211 | 22,655 | Elk Basin, Oregon Basin, Frannie. |
| Sheridan | 1,010 | 1,203 | Ash Creek-S, Ash Creek. |
| Sublette | 388 | 389 | La Barge, Tiptop, La Barge-N. |
| Sweetwater | 4,900 | 4,828 | Lost Soldier, Wertz, Church Buttes. |
| Uinta | 92 | 88 | Church Buttes, Spring Valley. |
| Washakie | 2,118 | 3,787 | Cottonwood Creek, Worland, Slick Creek. |
| Weston | 5,881 | 4,010 | Clareton, Mush Creek-W, Mush Creek. |
| Other fields | ---------- | 347 | |
| Total | 99,483 | 104,830 | |

Digitized by Google

**Phosphate Rock.**—The continuing strong demand for phosphate rock for agricultural purposes boosted the output of crude rock in Wyoming to 119,000 long tons in 1956, a more than twofold increase over 1955. It was mined in the State only at the Leefe mine of San Francisco Chemical Co. A fluosolids roasting plant at the Leefe property treated the entire Wyoming mine output and crude ore produced in Utah. San Francisco Chemical Co. announced in 1956 construction of a $750,000 plant at Leefe to upgrade ores from Utah and Wyoming. This plant climaxes more than 2 years of research at the Colorado School of Mines Research Foundation of Golden. At this new facility finely ground ore will be mixed with liquid chemicals to free phosphates from lower grade ores. By upgrading the ore in the existing "B" plant (roasting or fluosolids process), many carbonaceous materials are driven off as gases in the separation, enabling the company to utilize another 5-foot layer of phosphate rock. The new "C" plant permits an additional 6-foot layer to be worked. The new process can be used independently or in conjunction with the "B" plant. The company also announced a $2-million program to improve the efficiency of mining its thin-bedded deposits in the Intermountain area.

**Pumice.**—Production of volcanic scoria continued to decline in 1956; shipments of 45,500 tons represented the output of Tongue River Stone Co.—the only active producer in the State. The decrease in sales was due to adverse economic conditions, present for many years. Substitute materials of more constant quality, increasing costs of production, and a swing to the use of lightweight aggregate are some reasons for the decline. Of the 45,500 tons of scoria mined in 1956, only 1,600 tons was used as concrete aggregate, whereas 43,900 tons was utilized as railroad ballast. The latter use fluctuates considerably from year to year and does not provide a stable outlet for the industry. The Superior Pumice Co. and Sheridan Wyoming Coal Co., producers in 1955, were idle during 1956.

**Sand and Gravel.**—The output of sand and gravel in Wyoming during 1956 remained relatively stable compared with 1955. Of the 3.9 million tons produced in 1956, 3.1 million (79 percent) was Government-and-contractor production used in constructing and maintaining highways. Output by contractors and Governmental agencies, reported in 23 out of the 24 counties in the State, was valued at $2.2 million. In comparison, commercial production was 801,500 tons quarried in 15 counties and valued at $721,500. Ninety-three percent of the commercial output was washed, crushed, screened, or otherwise prepared; only 90 percent of the Government-and-contractor production was processed.

The principal commercial producers were Gilpatrick Construction Co., Inc., and Casper Concrete Co., Inc. The more active contractors for Government agencies were Knisely-Moore Co., Big Horn Construction Co., Boatright-Smith, Read Construction Co., W. E. Barling, Inc., and Northwestern Engineering Co.

Digitized by Google

million provided most of the total value, and Wyoming led the States reporting production of this type of clay. Crook County continued to be the leading producing area, followed by Big Horn, Weston, Natrona, and Johnson Counties. Three companies reporting shipments of over 100,000 tons were Baroid Division (National Lead Co.), Magnet Cove Barium Corp., and Wyodak Chemical Division (Federal Foundry Supply Co.).

**TABLE 9.—Shipments of bentonite, 1947–51 (average) and 1952–56**

| Year | Short tons | Value | Year | Short tons | Value |
|---|---|---|---|---|---|
| 1947–51 (average) | 370,747 | $3,979,139 | 1954 | 742,453 | $9,339,755 |
| 1952 | 692,853 | 9,168,708 | 1955 | 825,810 | 10,721,577 |
| 1953 | 670,756 | 9,861,321 | 1956 | 847,266 | 11,624,185 |

Of the total output of bentonite in 1956, 523,900 tons was used in rotary-drilling mud, 242,300 tons at foundries and steelworks, 15,000 tons for export, 13,400 tons in filtering and clarifying, and 500 tons in chemicals. The remaining 52,200 tons was used as concrete admixture (sealing dams, etc.), insecticides and fungicides, and miscellaneous other uses.

Miscellaneous clay was mined in Big Horn and Sheridan Counties by Lovell Clay Products Co. and Sheridan Pressed Brick & Tile Co. for building brick and other heavy clay products. Miscellaneous clay was also quarried in Albany County by Monolith Portland Midwest Co. for cement and by Great Western Aggregates, Inc., for lightweight aggregate. The latter company plant did not reach full productive capacity in 1956.

**Feldspar.**—Feldspar production in 1956, valued at $8,200, consisted of 1,200 long tons of potash feldspar mined by R. V. McGuire at the Casper Mountain mine (Natrona County), and Olett Mining Co. at the Johnson mine (Laramie County). The entire mine production was shipped to the Denver (Colo.) grinding plant of International Minerals & Chemical Corp.

**Gem Stones.**—Better statistical coverage and increased interest in collecting gem and ornamental stones swelled the value of this commodity group to $75,000 in 1956 compared with $57,000 in 1955. Stones collected during the year included agate, petrified wood, jade, jasper, epidote, thulite, and silicified turritella. Fremont County furnished the greater part of the total value, followed by Sweetwater, Park, Albany, Carbon, Natrona, Johnson, and Uinta Counties.

**Gypsum.**—Total output of gypsum in Wyoming in 1956 dropped from 22,400 tons in 1955 to 11,400 tons in 1956—a decrease of 49 percent. Two companies supplied all mine production; Wyoming Construction Co. in Albany County mined 11,000 tons of gypsum for cement, and Wyoming-Gulf Sulphur Co., Park County, quarried 400 tons of gypsum for agricultural purposes. A decline in mine production for the latter company from 12,000 tons in 1955 to 400 tons in 1956 accounted for the drop in State output.

Digitized by Google

Another development in 1956 was the beginning of solution mining of selected beds of trona. Hot water is injected under pressure into a well and allowed to percolate through the trona rock, dissolving the sodium minerals. The solution is removed through another well a few hundred feet away and then piped to the reduction plant for recovering the soda ash. The operation was experimental, and the potential commercial possibilities will depend on the underground behavior of the water, chemical impurities, and operating difficulties experienced.

Two companies—William E. Pratt and Iowa Soda Products Co.—shipped Glauber's salt, which was produced from old dry-lake brines in Carbon and Natrona Counties. The most important use for sodium sulfate was in manufacturing kraft paper and paperboard, but it also was consumed in processing rayon, wool, and other textile fibers, in dyes, and for many other chemical uses.

**Stone.**—A breakdown of the 1,333,000 tons of various types of stone quarried in Wyoming revealed that crushed limestone totaled 1,053,000 tons, crushed granite 216,000 tons, crushed miscellaneous stone 56,000 tons, crushed sandstone 7,000 tons, and dimension limestone 178 tons. The principal uses in order, were railroad ballast (500,000 tons), road construction (409,000 tons), and cement, sugar refining, mineral food, flux, and miscellaneous applications (424,000 tons).

Crushed limestone was produced in 18 counties, and the major producers were Guernsey Stone Co., Monolith Portland Midwest Co., and Great Western Sugar Co. Crushed granite was quarried in Laramie, Sweetwater, and Park Counties, and the principal producer was Morrison-Knudsen Co. Crushed miscellaneous stone was also reported for two counties; the Sheridan Wyoming Coal Co. as contractor for the Chicago, Burlington & Quincy Railroad was the major quarry operator. Crushed sandstone was produced in Platte, Park, and Washakie Counties by C. F. Lytle Co., Federal Bureau of Reclamation, D. M. Manning, and Long Construction Co.

**Sulfur (Recovered Elemental).**—Shipments of elemental sulfur in Wyoming rose to 121,200 long tons compared with 120,700 tons in 1955. Plant production reports indicate a decline in shipments for Jefferson Lake Sulphur Co., Big Horn County; and Seaboard Oil Co. and Stanolind Oil & Gas Co., Park County. However, a 12-percent increase in sales by the Texas Gulf Sulphur Co. more than offset the decreases for other companies and resulted in a net gain in shipments for the industry.

The Neiber Dome plant of Signal Oil & Gas Co. (Washakie County) was completed during 1956; 9,300 tons of elemental sulfur was produced at this facility and at the Stockham Federal plant constructed by the same company in 1955; sulfur was stockpiled, and no shipments were made during 1956.

## METALS

**Beryllium.**—International Minerals & Chemical Corp. made a small shipment of beryl (beryllium concentrate) to the Government General Services Administration (GSA) Custer (S. Dak.) Purchase Depot from the Catherine No. 1 mine in Natrona County in 1956.

Digitized by Google

**Gold, Copper, and Silver.**—The increased output of gold, copper, and silver in Wyoming in 1956 was significant because although its value was small in relation to other commodities, it showed renewed activity in this phase of the mineral industry in Wyoming. The production came from 1 active mine in each of 3 counties—Carbon, Fremont, and Lincoln—and cleanup activities at a mill in Fremont County. Gold and copper ores were shipped directly to a smelter from the Platt mine (new in 1956) in Carbon County by R. H. Platt & H. V. Morris. Elayer Co., Inc., treated ore from the Duncan mine in Fremont County in its new 60-ton-per-day mill which was completed and tested in December 1955. The Pioneer Carissa Gold Mines, Inc., shipped to a smelter a small quantity of material, which was recovered from a cleanup of the Carissa mill (Fremont County). Blake G. Holley shipped a small quantity of copper ore to the American Smelting and Refining Co. smelter at Garfield (Utah) from the Lake Creek mine 19 miles north of Cokeville in Lincoln County.

**TABLE 11.—Mine production of gold, silver, copper, and lead, 1947–51 (average) 1952–56, and total, 1867–1956, in terms of recoverable metals [1]**

| Year | Mines producing | | Material sold or treated[2] (short tons) | Gold (lode and placer) | | Silver (lode and placer) | | Copper | | Lead | | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Fine ounces | Value | Fine ounces | Value | Short tons | Value | Short tons | Value | |
| 1947–51 (average) | 1 | 1 | 1,747 | 400 | $13,993 | 26 | $23 | ------ | ------ | ------ | ------ | $14,016 |
| 1952 | ------ | 1 | ------ | 1 | 35 | ------ | ------ | ------ | ------ | ------ | ------ | 35 |
| 1953 | 1 | 1 | 2 | 1 | 35 | 11 | 10 | 1 | $574 | ------ | ------ | 619 |
| 1954 | 2 | ------ | 1,445 | 407 | 14,245 | 74 | 67 | 1 | 590 | ------ | ------ | 14,902 |
| 1955 | 1 | ------ | 206 | 52 | 1,820 | 20 | 18 | ------ | ------ | ------ | ------ | 1,838 |
| 1956 | 3 | ------ | 3,202 | 762 | 26,670 | 154 | 139 | 3 | 2,550 | ------ | ------ | 29,359 |
| 1867–1956 | ------ | ------ | [3] | 81,263 | 1,952,533 | 75,080 | 52,148 | 16,331 | 5,688,086 | 14 | $1,486 | 7,694,253 |

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped directly to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

**Iron Ore.**—Declining iron-ore output (shipments) in Wyoming in 1956 resulted partly from a labor strike throughout July at the Colorado Fuel & Iron Corp. steel mill at Pueblo, Colo., which used the entire output of hematite iron ore from its Sunrise mine in the Hartville district (Platte County, Wyo.). Minor fluctuations in output from year to year can be attributed to the demand for steel and carryover of stocks at the steel plant.

Magnetite Products Corp., which began operations November 29 at the Cobar No. 1 mine in Albany County, mined a small quantity of magnetite for use as a coating of underwater pipelines and transmission lines.

The Columbia-Geneva Steel Division of United States Steel Corp. had taken major steps toward opening up a new source of iron ore in the South Pass area of southwest Wyoming. During 1956 contracts were completed with the Centennial Development Co. of Eureka, Utah, for exploration and development work at the mine. In addition, the company made test shipments of the ore to its mill



Digitized by Google

at Provo, Utah, and to Duluth, Minn. According to company officials, construction of a 30-mile railroad from the Union Pacific mainline to the deposit would be necessary to fully develop the property for commercial use of the ore.

TABLE 12.—Shipments of iron ore, total 1900–51 and by years, 1952–56

| Year | Long tons | Year | Long tons |
|---|---|---|---|
| 1900–51 | 24,671,605 | 1954 | 458,237 |
| 1952 | 484,945 | 1955 | 748,831 |
| 1953 | 654,285 | 1956 | (1) |

[1] Figure withheld to avoid disclosing company confidential data.

**Rare-Earth Metals.**—Exploration and research in the rare earths were carried on principally by the United States Yttrium, Inc., at Laramie. This company purchased some combined rare-earth oxides from the Rare Earth Chemical Co. at Mead, Colo., for experimental work. Although recovery of separate oxides was made, no sales were reported.

**Titanium.**—An extensive exploration program begun in 1951 by the Union Pacific Railroad Co. on the titaniferous-magnetite deposits in the Iron Mountain area of the Laramie Range northwest of Laramie continued during 1956. The company reported that the ore reserves were estimated at 230 million tons, containing 20 million tons of titanium, in the 4,500-acre area controlled by the firm.

**Tungsten.**—The entire output of tungsten in Wyoming in 1956 came from the new mining operation of Warren Oil & Uranium Corp. of Fort Worth, Tex., at the old Robeson tungsten mines on Hoodoo Creek above the Quien Sabe ranch in the Copper Mountains section of central Wyoming. The ore was trucked to the Pioneer Carissa mill near South Pass City for treatment. The concentrate was sold to Wah Chang Corp. and Minerals Engineering Co.

**Uranium.**—For the 12 months beginning July 1, 1955, uranium mines in Wyoming produced 98,790 tons of ore averaging 0.22 percent contained $U_3O_8$. This tonnage represented 5 percent of the domestic total. Production data are based on information supplied to the Federal Bureau of Mines by the AEC. The most important producing area was Fremont County, followed by Converse, Campbell, and Carbon Counties.

Ore reserves for the State, as of November 1, 1956, totaled 2.3 million tons at an average grade of 0.22 percent contained $U_3O_8$.[3] Wyoming was credited with 3.8 percent of the total United States reserve estimate, which includes measured, indicated, and inferred tonnages.

Two contracts for mill construction in Wyoming were negotiated during the year with the AEC—a 400-ton-per-day mill was under construction at Split Rock by the end of the year, and a 750-ton-per-day mill was scheduled for construction in the Gas Hills area.

[3] Grand Junction (Colo.) Operations Office, Statistics on Domestic Uranium Production and Ore Reserves: AEC Release 178 Dec. 13, 1956.

Digitized by Google

**TABLE 13.—Mine production of uranium ore in Wyoming during July 1955–June 1956[1]**

| County | July–December, 1955 | | | January–June, 1956 | | |
|---|---|---|---|---|---|---|
| | Number of properties | Ore (short tons) | $U_3O_8$ contained (pounds) | Number of properties | Ore (short tons) | $U_3O_8$ contained (pounds) |
| Albany | 2 | (2) | (2) | 1 | (2) | (2) |
| Big Horn | 1 | (2) | (2) | 3 | (2) | (2) |
| Campbell | 23 | 2,867 | 18,715 | 20 | 3,014 | 13,138 |
| Carbon | 3 | (2) | (2) | 4 | (2) | (2) |
| Converse | 10 | (2) | (2) | 12 | (2) | (2) |
| Crook | 9 | (2) | (2) | 5 | (2) | (2) |
| Fremont | 47 | 28,355 | 121,111 | 28 | 44,578 | 204,984 |
| Johnson | 5 | 214 | 441 | 9 | (2) | (2) |
| Natrona | 3 | (2) | (2) | 4 | (2) | (2) |
| Niobrara | 3 | 65 | 138 | 1 | (2) | (2) |
| Sweetwater | 1 | (2) | (2) | 1 | (2) | (2) |
| Washakie | 1 | (2) | (2) | | | |
| Weston | | | | 1 | (2) | (2) |
| Undistributed | | 9,864 | 41,625 | | 9,833 | 42,718 |
| Total | 108 | 41,365 | 182,030 | 89 | 57,425 | 260,840 |

[1] Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

During the latter part of the year, shipments to the AEC ore-buying station at Riverton were restricted because of the announced plans for the Gas Hills and Split Rock mills. This restrictive action avoided an excess stockpile of ore, which would later have to be reshipped to the processing plants.

Reports of private drilling showed that exploration activity in Wyoming tripled that of 1955 and totaled more than 1.2 million feet. Of this total footage, 60 percent was drilled in Fremont County, 20 percent in Converse, 10 percent in Campbell, and 5 percent in Carbon.

Four DMEA contracts for uranium exploration in Wyoming were executed during 1956; details are shown in table 3.

**Vanadium.**—A small quantity of vanadium was recovered from Wyoming uranium-vanadium ores shipped to the mill at Grand Junction, Colo. Most of the Wyoming uranium ores treated did not contain enough vanadium to warrant its recovery; however, a few deposits (in Campbell, Fremont, and Big Horn Counties) are known to contain more than 1.0 percent $V_2O_5$.

## REVIEW BY COUNTIES

**Albany.**—The value of mineral production in Albany County continued upward and reached $5.4 million in 1956. Shipments of types I, II, and III, high-sulfate-resistance, oil well, and waterproof-portland cements contributed most of the value. Finished cement was hauled to consumers by truck and rail to points in Wyoming, Colorado, Idaho, Nebraska, New Mexico, and Texas. The average price per barrel in 1956 was $3.49 compared with $3.11 in 1955. Shale and crushed limestone quarried near the plant supplied part of the raw materials required. Gypsum produced locally by the Wyoming Construction Co. also was used to manufacture cement. Fluorspar, mill scale, pyrite cinders, and other miscellaneous raw materials were purchased from outside the county.

Digitized by Google

Petroleum was produced from five fields in Albany County and ranked second in value as a mineral commodity. A small quantity of natural gas was also reported. The Ohio Oil Co. produced natural-gas liquids in a plant at Rock River.

Great Western Aggregates, Inc., quarried shale from a deposit south of Laramie and trucked the crude ore to its shale-bloating plant adjacent to the Monolith cement plant.

**TABLE 14.—Value of mineral production in Wyoming, 1955–56, by counties**

| County | 1955 | 1956 | Minerals produced in 1956 in order of value |
|---|---|---|---|
| Albany | $5,175,657 | $5,365,047 | Cement, petroleum, stone, clays, sand and gravel, gypsum, iron ore, gem stones. |
| Big Horn | 33,181,201 | 34,593,845 | Petroleum, clays, sulfur, sand and gravel, stone. |
| Campbell | 606,921 | 624,441 | Coal, sand and gravel, petroleum. |
| Carbon | 6,657,027 | 6,713,246 | Petroleum, coal, sand and gravel, stone, sodium sulfate, copper, gem stones, gold, silver. |
| Converse | 15,632,671 | 15,340,568 | Petroleum, coal, sand and gravel. |
| Crook | 4,136,889 | 5,956,804 | Clays, petroleum, sand and gravel, stone. |
| Fremont | 32,063,315 | 34,888,506 | Petroleum, sand and gravel, stone, gem stones, gold, coal, tungsten concentrate, copper, silver. |
| Goshen | 390,701 | 377,650 | Petroleum, sand and gravel, stone. |
| Hot Springs | 33,019,352 | 35,369,539 | Petroleum, coal, sand and gravel, stone. |
| Johnson | 18,463,539 | 18,012,913 | Petroleum, clays, sand and gravel, coal, stone, gem stones. |
| Laramie | 1,936,702 | 2,039,512 | Petroleum, stone, sand and gravel. |
| Lincoln | 2,684,013 | 3,088,868 | Coal, phosphate rock, petroleum, sand and gravel, stone, copper, silver, gold. |
| Natrona | 15,184,799 | 18,101,568 | Petroleum, sand and gravel, clays, sodium sulfate, stone, feldspar, beryllium concentrate, gem stones. |
| Niobrara | 4,534,102 | 4,149,325 | Petroleum, sand and gravel, stone. |
| Park | 49,729,321 | 56,045,075 | Petroleum, sulfur, sand and gravel, stone, gypsum, gem stones. |
| Platte | 5,646,008 | 4,923,367 | Iron ore, stone, sand and gravel. |
| Sheridan | 4,114,943 | 4,423,113 | Petroleum, coal, sand and gravel, pumice clays. |
| Sublette | 989,060 | 1,018,320 | Petroleum, sand and gravel, stone. |
| Sweetwater | 26,561,629 | 25,526,781 | Petroleum, sodium carbonate, coal, sand and gravel, gem stones, stone. |
| Teton | 126,175 | 119,255 | Sand and gravel, stone. |
| Uinta | 242,780 | 229,220 | Petroleum, sand and gravel, stone, gem stones. |
| Washakie | 7,320,331 | 11,657,056 | Petroleum, sulfur, sand and gravel, stone. |
| Weston | 18,336,363 | 12,955,598 | Petroleum, clays, sand and gravel, stone. |
| Yellowstone Park | 8,770 | ---- | |
| Undistributed [1] | 11,822,061 | 15,377,687 | |
| Total [2] | 297,752,000 | 316,897,000 | |

[1] Includes value of natural gas, natural-gas liquids, sand and gravel, stone, gem stones, vanadium, and uranium.
[2] Total adjusted to eliminate duplicating the value of raw materials used in cement.

Sand and gravel output consisted of 18,000 tons of commercial production quarried by C. F. Yeoman and M. C. Justesen and 64,000 tons of Government-and-contractor output produced by C. J. Abbott, C. L. Hubner, Knisely-Moore Co., Larsen-Meyer Construction Co., and J. A. McPherson & Co., Inc., as contractors for the Wyoming State Highway Department. Ben Nott reported the collection of agate at the Bean ranch.

A small quantity of magnetite was mined by Magnetite Products Corp. from the Cobar No. 1 mine.

During the first half of 1956 uranium ore was shipped from the Desert Rose lease by Lincoln W. Sexton.

**Big Horn.**—Big Horn County oilfields along the northeastern flank of the Big Horn basin yielded 12.8 million barrels of crude petroleum. Nine-tenths of the county petroleum output was derived from the

Digitized by Google

Bonanza, Garland, and Byron fields. In the Torchlight field Stanolind Oil & Gas Co. discovered and produced from the Phosphoria formation. At Lovell the Ohio Oil Co. closed its refinery at the end of April. In October the plant was purchased by Big Horn Refining Co. and operated in October through December 1956.

In addition, the area was a source of natural gas produced largely from the Manderson and Five Mile fields. Natural-gas liquids and sulfur were recovered from the gas in plants at Manderson. The Manderson sulfur plant of Jefferson Lake Sulphur Co. completed its first full year of operation in 1956. This facility processed sour natural gas in conjunction with the natural-gas-liquids plant of Mobil Producing Co. A Modified Claus process was used to recover hydrogen sulfide from the natural gas, and in Wyoming it was the only plant that stored its sulfur in a molten state. When shipments of the finished product were made, the molten sulfur was drawn from the storage tank and fed to a multidecked rotating drier, where water passing between steel plates crystallized the sulfur. After crystallization the solidified mass was fed to a storage bin. The company also used the conventional pond or pool-type finished-product storage.

Magnet Cove Barium Corp. and Wyo-Ben Products Co. continued to mine and process crude bentonite for use in oil-well-drilling mud, foundries and steelworks, insecticides and fungicides, and chemicals and for export. Total output of ground material increased 15 percent in 1956 as a result of a strong demand for this commodity. Lovell Clay Products Co. quarried miscellaneous clay from an open pit near Lovell. The raw clay was trucked to the company brick plant at Lovell and used in building brick and other structural clay products.

Sand and gravel production in 1956 resulted from contracts let by the United States Bureau of Public Roads and the Wyoming State Highway Department. Knisely-Moore Co. was the contractor for the Federal agency and W. E. Barling, Inc., S. Birch & Sons Construction Co., and Alfred E. Matheson were the contractors for the State highway department. Stone output used as riprap consisted of 1,000 tons of crushed limestone supplied to the Wyoming State Highway Department by S. Birch & Sons Construction Co. and Forgey Bros. Co.

During the first 6 months of the year, uranium ore was shipped from the Mike No. 10 by Feusner & Sons and the Tri Pacer No. 4 and No. 5 by the Super Cub Mining Co.

**Campbell.**—Coal, sand and gravel, uranium, and petroleum comprised the minerals produced in Campbell County in 1956.

Output from stripping by the Wyodak Coal Co. continued to increase and furnished the county production of coal. Employment for the year averaged 27 men, who worked 307 days.

Uranium-ore shipments from 20 properties were made to Edgemont (S. Dak.), Riverton (Wyo.), and to a lesser extent Grand Junction (Colo.) during the first 6 months of the year. Total tonnage for the period was 3,014 tons of ore, with an average grade of 22 percent contained $U_3O_8$. The Colorado No. 1 (Price Exploration Co.), KM No. 1 (Charles Kelley), E & K No. 1 (Edwards & Kelley), and Phil No. 12 (Globe Mining Co.) claims furnished three-quarters of the production for the half year.

Digitized by Google

Digitized by Google

[illegible]

**Goshen.**—[illegible]

[illegible]

**Hot Springs.**—[illegible]

The Ronoco Coal Co. Ronoco mine and the Grass Creek Coal Co. (Grass Creek or T & T mine) produced coal.

Taggart Construction Co., as contractor for the State highway department, was the only producer of sand and gravel in Hot Springs County during 1956. Stone production consisted of 2,700 tons of crushed limestone produced by Taggart Construction Co. and C. M. Smith; dimension limestone quarried by Husman Bros., Inc.; and crushed miscellaneous stone produced by C. M. Smith. All stone output for 1956 was used in constructing and maintaining highways.

**Johnson.**—Petroleum was produced from eight fields in Johnson County. Almost the entire output came from the Sussex, Meadow Creek, and West Sussex-Dugout fields; the Meadow Creek field was also a source of natural gas. During the year, Shell Oil Co. discovered the South Crazy Woman field, which yielded oil from the Tensleep formation. The remaining mineral fuel coal was produced from the Clear Creek No. 2 mine by the Clear Creek Coal Co.

In the first half of the year uranium ore was shipped from nine properties in Johnson County. Most productive of these properties were the Hanna No. 1 and Tyfil No. 1 mined by Sundance Metals & Uranium Co. and the Alice Mae Nos. 1 and 2 mined by Cook, Jones, Hansaker, & Swanson.

Nonmetals [illegible]

Digitized by Google

Sand and gravel production in 1956 reached 193,000 tons; Mullinax Engineering Co. quarried commercial paving gravel; Big Horn Construction Co., Husman Bros., Inc., Knisely-Moore Co., Richardson Construction Co., and M. S. Torbert & Son (contractors for the State highway department) prepared Government-and-contractor paving gravel.

A small quantity of petroleum was produced from the Bertha field.

**Carbon.**—Petroleum was produced from 11 Carbon County oilfields; the Wertz field (which lies both in Carbon and Sweetwater Counties), Rock River field, and Big Medicine Bow field were the most important sources of oil, supplying over 80 percent of the county total. The county was also a source of natural gas. At Sinclair the Sinclair Refining Co. operated the largest refinery in the State.

Three mines produced coal in 1956; two were strip mines. The mines, Nugget No. 1 (strip), Hannah No. 2 (strip), and Thomas, employed an average of 33 men.

In terms of value, sand and gravel was the major nonmetal produced in Carbon County during 1956. Production consisted of 16,000 tons of paving sand and gravel quarried by R. J. Voerding & Co. and 110,100 tons of paving sand and gravel produced by State highway department crews and private contractors. The firms holding highway contracts with the Wyoming State Highway Department were W. E. Barling, Inc., Knisely-Moore Co., and Larsen & Meyer Construction Co. Stone production comprised 123,000 tons of crushed limestone produced under contract for the State highway department and the city of Casper. The major contractors were Boatright & Smith and W. E. Barling, Inc.

Iowa Soda Products Co. produced 173 tons of sodium sulfate (Glauber's salt) in 1956 at Rawlins. H. L. Harvey, Halsey Kortes, and Root's Hobby Business collected jade, agate, and petrified wood valued at $315.

During the first half of the year the Fremont Uranium Corp. shipped uranium ore from the Cedar Hills No. 6 claim. Small shipments were also reported from three other properties.

R. H. Platt & H. V. Morris recovered gold, silver, and copper (combined value, $2,107) from 10 tons of gold ore and 8 tons of copper ore mined from the Platt mine in Carbon County.

**Converse.**—Output of petroleum (6.3 million barrels) from 7 oilfields furnished the major part of mineral value attributed to Converse County in 1956. The Carter Oil Co. was credited with a wildcat discovery in the Shawnee area (T. 34 N., R. 69 W.); production came from the Mesaverde formation.

Continental Oil Co. closed its refinery at Glenrock in January and was gradually dismantling the refinery at year end.

Uranium-ore shipments from 12 properties were made to the mill at Edgemont, S. Dak., in the first half of the year. The most productive properties were the Pat No. 8 operated by Kerr-McGee Oil Industries, Inc., and the Turnercrest No. 1 and No. 2 operated by Sundance Petroleum & Uranium Co.

The source of coal production in the county was the Antelope strip mine operated by the Best Coal Co.

Sand and gravel production in Converse County totaled 18,000 tons

Digitized by Google

valued at $8,000; the entire output was used in road construction. During the summer ground was broken for a new coal-fired thermal-electric plant at Glenrock by the Pacific Power & Light Co. The new plant, of 100,000-kw. capacity, reportedly will be supplied with fuel from strippable coal deposits 15 miles north of Glenrock. The coal is in 2 seams 25 and 35 feet thick and has a heat content of 7,800–8,000 B. t. u. per pound. Stripping ratios are expected to be less than 2 : 1.

**Crook.**—The total value of minerals produced in Crook County continued to rise; all commodities increased significantly in both quantity and value of output. Heading the list of important commodities was bentonite. Output in 1956 reached 404,000 tons valued at $5.3 million—a gain of 27 percent in tonnage and 32 percent in value over 1955. Open pits were mined by the Baroid Division, National Lead Co.; Wyodak Chemical Division, Federal Foundry Supply Co.; Eastern Clay Products Department, International Minerals & Chemical Corp.; American Colloid Co.; and Black Hills Bentonite Co. Bentonite-grinding plants were operated by National Lead Co. and Black Hills Bentonite Co., and the remaining crude material was processed at company-owned plants in other counties or at Belle Fourche, S. Dak.

Petroleum output gained substantially as a result of renewed interest in the Donkey Creek area. The field was originally discovered in 1953, but no substantial development was undertaken until 1956. True Oil Co. drilled 11 development wells in the field, one of which was dry. An additional producing well was drilled by The Texas Co.

Two new fields were discovered in 1956. The West Moorcroft field, producing from the Muddy sandstone, was discovered by the Owanah Oil & Development Co. The Glenwood Oil Co. was credited with discovering a productive zone from both the Lakota and Dakota formations in the Barton field.

Sand and gravel production also increased significantly over 1955 owing largely to more highway-construction activity in the county. Government-and-contractor output reached 238,000 tons, quarried by Big Horn Construction Co., Black Hills Constructors, Inc., Northwestern Engineering Co., and Summit Construction Co. as contractors for the Wyoming State Highway Department. All commercial production was reported by Mullinax Engineering Co. Some contractors for the State highway department quarried 4,200 tons of crushed limestone.

Uranium ore was shipped from several properties to the Edgemont (S. Dak.) mill in the first half of the year; the Busfield lease of Sodak Uranium & Mining Co., Inc., and the New Haven group of claims of Homestake Mining Co. furnished most of the ore.

**Fremont.**—Fremont County was a source of 11 mineral commodities in 1956. In addition to petroleum, which was the most valuable, uranium, natural gas, construction materials, gem stones, coal, gold, and other metals were produced within the county.

The chief sources of petroleum were the following fields, which produced over 1 million barrels during the year: Steamboat Butte, Big Sand Draw, Beaver Creek, Winkleman Dome, and Happy Springs; 16 other fields also yielded crude petroleum. Two of the above fields—Beaver Creek and Big Sand Draw and the Riverton

Digitized by Google

Dome field were important sources of natural gas. Natural gasoline was extracted at the Sand Draw plant by Northern Utilities Co.

Two discoveries (1 oil and 1 gas) were made during the year; both represented new productive areas in established fields. A new oil zone was found in the Crooks Gap field and a new gas zone in the South Sand Draw field.

Fremont County was Wyoming's most important uranium-producing area. During the year two mill-construction contracts were negotiated with the AEC. The first—a 400-ton-per-day plant—was under construction at Split Rock by the Lost Creek Oil & Uranium Co. The company operated properties in the Crooks Gap district and expected to meet ore requirements from its own operations plus ore commitments from operators in both the Crooks Gap and the Gas Hills districts. In the Gas Hills, the Lucky Mc Uranium Corp. (a subsidiary of Utah Construction Co.) negotiated a contract for a 750-ton-per-day mill. Ore for the latter mill was to be supplied from the Lucky Mc mine and other properties in the Gas Hills. When the plans for the two mills were announced, companies shipping to the Riverton buying station were placed on a quota basis to avoid excessive stockpiling of ore, which would later have to be reshipped to mills.

During the first 6 months of the year the more productive deposits were as follows:

| Mine: | *Operator* |
|---|---|
| Bountiful No. 1 | Valley-Dean Corp. |
| Bountiful No. 9 | Two States Uranium Co. |
| Bullrush No. 5 | Savanna Construction Co. |
| Dick No. 19 | Globe Mining Co. |
| George No. 12 | Do. |
| George No. 14 | Do. |
| John No. 2 | Vitro Minerals Corp. |
| Lucky Mc No. 2 | Lucky Mc Uranium Corp. |
| Lucky Mc No. 20 | Do. |
| Phil No. 3 | Globe Mining Co. |

The listed properties, all in the Gas Hills district, supplied more than three-quarters of the total ore produced in the county during the 6-month period. Other productive areas were the Crooks Gap district and Copper Mountain area.

The major nonmetals produced in the county continued to be construction materials—sand and gravel and stone. Gem stones valued at $54,000 were also reported. Sand and gravel and stone were produced by contractors for the State highway department and the Federal Bureau of Reclamation, except for a small quantity of commercial sand and gravel. Fremont County was again the center of the gem or ornamental-stone industry of the State. The types of stone collected in 1956 were predominantly jade, but epidote, thulite, agate, petrified wood, and jasper were also reported.

Elayer Co., Inc., mined 3,161 tons of gold ore containing some silver and copper from the Duncan mine and treated it in the company mill on the property. Material containing gold and some silver was recovered from a cleanup of the Carissa mill by Pioneer Carissa Gold Mines, Inc., and shipped to a smelter.

The Warren Oil & Uranium Corp. (Fort Worth, Tex.) reopened the old Robeson mines (sec. 22, T. 40 N., R., 93 W.) in the Owl Creek

Digitized by Google

Mountains northeast of Shoshoni in Fremont County. It was the only producer of tungsten in Wyoming in 1956. The ore was treated at the Pioneer Carissa mill near South Pass City.

**Goshen.**—Petroleum was produced from the Torrington field. During the year 13 wildcat holes were completed; none were successful. In the Torrington field, 5 development wells were drilled; only 1 was productive.

Construction and maintenance of highways by the construction crews of the Goshen County Highway Department and State highway department through private contractors resulted in the production of 255,000 tons of paving sand and gravel. The major contractors were Northwestern Engineering Co., Knisely-Moore Co., and Alfred E. Matheson. In addition, the Goshen Irrigation District produced 2,000 tons of paving sand and gravel for the Federal Bureau of Reclamation. Stone output amounted to 465 tons of crushed limestone used for riprap and quarried by contractors for the State highway department.

**Hot Springs.**—Mineral commodities produced in Hot Springs County in 1956 were petroleum, coal, sand and gravel, and natural gas; petroleum supplied virtually the entire total value. The major producing oilfields were the Hamilton Dome, Grass Creek, Gebo, Murphy Dome, and Golden Eagle; these 5 fields produced 90 percent of the county output of crude petroleum. Skelly Oil Co. was credited with discovery of the East Blue Springs field; oil was produced from the Phosphoria formation. Development drilling was concentrated in the Hamilton Dome and the Grass Creek fields. At Thermopolis Empire State Oil Co. operated a 5,000-barrel-per-day refinery on crude oil from the Hamilton Dome field.

The Roncco Coal Co. (Roncco mine) and the Grass Creek Coal Co. (Grass Creek or T & T mine) produced coal.

Taggart Construction Co., as contractor for the State highway department, was the only producer of sand and gravel in Hot Springs County during 1956. Stone production consisted of 2,700 tons of crushed limestone produced by Taggart Construction Co. and C. M. Smith; dimension limestone quarried by Husman Bros., Inc.; and crushed miscellaneous stone produced by C. M. Smith. All stone output for 1956 was used in constructing and maintaining highways.

**Johnson.**—Petroleum was produced from eight fields in Johnson County. Almost the entire output came from the Sussex, Meadow Creek, and West Sussex-Dugout fields; the Meadow Creek field was also a source of natural gas. During the year, Shell Oil Co. discovered the South Crazy Woman field, which yielded oil from the Tensleep formation. The remaining mineral fuel—coal—was produced from the Clear Creek No. 2 mine by the Clear Creek Coal Co.

In the first half of the year uranium ore was shipped from nine properties in Johnson County. Most productive of these properties were the Hanna No. 1 and Tyfil No. 1 mined by Sundance Petroleum & Uranium Co. and the Alice Mae Nos. 1 and 2 mined by Cram, Jones, Hansaker, & Swanson.

Nonmetals contributed only a small part of the total value of minerals produced in the county during 1956. Bentonite mined by Benton Clay Co. and milled at Casper was sold as a constituent of rotary-drilling mud. Paving gravel for highway construction was produced

Digitized by Google

by some highway contractors. Ornamental stone, consisting of 150 pounds of petrified wood, was collected by Crane's Rock Shop, and Boatright & Smith quarried 270 tons of crushed limestone for the State highway department.

**Laramie.**—Crude petroleum was produced from 4 fields (Horse Creek, Pine Bluffs, Borie, and Tracy) in 1956 and totaled 472,000 barrels. The Borie field was also a source of natural gas.

At Cheyenne, Frontier Refining Co. refined crude petroleum from oilfields of the Big Horn, Powder River, and Denver-Julesburg basins.

Laramie County was the leading producer of stone and ranked second in output of sand and gravel. Stone production comprised crushed granite quarried by Morrison-Knudsen Co. at its Horse Creek mine. The output was used mostly as railroad ballast and also as riprap, fill, poultry grit, and chips. Crushed limestone was mined by Great Western Sugar Co., Read Construction Co., and some contractors for the Wyoming State Highway Department. Commercial output of limestone was used mainly in refining sugar; a substantial tonnage was used for concrete aggregate, railroad ballast, mineral food, riprap, and flux. Government-and-contractor output was employed solely as riprap. The 372,000 tons of sand and gravel was entirely Government-and-contractor production reported by Big Horn Construction Co., Blanchard Construction Co., Knisely-Moore Co., J. A. McPherson & Co., Inc., Platte Valley Construction Co., and Read Construction Co. All material was washed or otherwise prepared and used by these contractors under contracts with the State highway department.

**Lincoln.**—Mineral products of Lincoln County in 1956 were, in order of value: Coal, phosphate rock, petroleum, sand and gravel, stone, natural gas, copper, and gold.

Output of coal increased to 690,000 tons in 1956. The Kemmerer Coal Co. (active at the Elkol strip mine and the Brilliant No. 8 underground mine) was the major producer. In addition, coal was produced from the Blind Bull mine by the Blind Bull Coal Co. Average employment at these 3 mines was 145 men.

The Lincoln County part of the La Barge field continued to be a source of crude petroleum. Three successful development wells were completed in the southern part of the field by Vaughan B. Connelly in 1956. The La Barge field was also a source of natural gas.

Nonmetals made up 28 percent of the total value of all minerals produced in Lincoln County. Phosphate rock was the most important nonmetal and was valued at $721,000—a more than twofold increase over 1955. The San Francisco Chemical Co. was the only active mining company; all output came from the Leefe mine. Sand and gravel production valued at $133,000 was chiefly Government-and-contractor output for the Wyoming State Highway Department. Highway-construction activities resulted in quarrying 6,100 tons of crushed limestone for riprap and roadstone by Big Horn Construction Co. and Rissler & McMurrey Co., Inc.

The Lake Creek mine near Cokeville in Lincoln County was mined from August 12 to October 10 by Blake G. Holley of Ogden, Utah. A total of 22 tons of ore, 13½ tons averaging 2.5 percent copper and 8½ tons averaging 3.4 percent copper was mined and shipped to the American Smelting and Refining Co. smelter at Garfield, Utah.

Digitized by Google

**Natrona.**—Natrona County oil production, principally from the Salt Creek field, yielded 60 percent of the county total; 23 other fields produced crude petroleum. The Salt Creek field was also an important source of the Wyoming natural-gas supply.

Five oil and two gas discoveries were reported in 1956; the most important appeared to be the Sinclair Oil & Gas Co. oil-productive zone in the Tensleep formation in the East Salt Creek field. The well reportedly flowed at nearly 2,000 barrels per day on initial testing.

Three refineries were operated at Casper by Standard Oil Co. of Indiana, The Texas Co., and Socony-Mobil Oil Co. At Midwest, Stanolind Oil & Gas Co. operated a natural-gas-liquids plant.

Sand and gravel continued to be the most important nonmetal in value. Output in 1956 reached 380,000 tons; 152,000 was commercial production quarried and prepared by the Casper Concrete Co., Malloy Construction Co., Mullinax Engineering Co., and See Ben Realty Co. In comparison, Government-and-contractor production was 228,000 tons of paving sand and gravel produced by crews of the State highway department and private contractors engaged in roadwork for the highway department. The Benton Clay Co. mined bentonite, which it milled at its Casper plant. Sales in 1956 were 74 percent greater than in 1955, and the ground bentonite was employed as rotary-drilling mud and for sundry other uses.

Natrona County was the principal source of sodium sulfate in the State. William E. Pratt recovered Glauber's salt from a deposit near Casper.

Government-and-contractor production for highway use contributed 1,150 tons of crushed limestone. Agate and petrified wood were collected and valued at $160. For the first time in many years, crude feldspar was mined and sold in 1956. Mine-run ore was quarried by R. V. McGuire from the Casper Mountain mine, and shipments were made to the Denver (Colo.) grinding plant of International Minerals & Chemical Corp.

Uranium ore was shipped from 4 properties during the first 6 months of the year. Most productive of the properties was the Aljob Mining Co. Aljob No. 9 in the eastern part of the Gas Hills district.

International Minerals & Chemical Corp. produced beryllium concentrate (beryl) from the Catherine No. 1 mine. The concentrate was hand-sorted and sold to the Government (GSA) Custer (S. Dak.) Purchase Depot.

**Niobrara.**—Crude oil was produced from eight fields; Lance Creek, Little Buck Creek, and Mule Creek fields were the most important. The Lance Creek and East Lance Creek fields were sources of natural gas. One refinery was operated at Lusk by the C & H Refinery Co.; the refinery processed crude oil from the Lance Creek field.

At Manville, Continental Oil Co. operated a natural-gasoline plant. During 1956 construction was begun on a new natural-gas-liquids plant to replace the existing Continental facilities. The new unit will be owned by Continental Oil Co., Argo Oil Co., and the Ohio Oil Co. (the operator).

Owing to a shift in highway-construction work, output of sand and gravel in 1956 declined to 51,000 tons—less than half of the 1955 total. Mullinax Engineering Co. was the commercial operator, and

Digitized by Google

Lamb Construction Co. and J. A. McPherson & Co., Inc., were the producer-contractors for the Wyoming State Highway Department. Crushed limestone for highway use totaled 146 tons.

J. L. Starns shipped uranium ore from the Silver Cliff property.

**Park.**—Park County was the State's most important crude-oil-producing area and supplied 22 percent of the Wyoming total in 1956. The county was an important source of natural gas and elemental sulfur. Construction materials, natural-gas liquids, gypsum, and gem stones also were produced.

The most important oilfields, in terms of production, were the Elk Basin, Oregon Basin, and Frannie, which yielded 80 percent of the county output; production was also reported from 22 other fields. Major natural-gas-producing fields were Elk Basin, Heart Mountain, and Silvertip.

The Husky Oil Co. operated one refinery at Cody. At Elk Basin a natural-gas-liquids plant and sulfur-recovery unit were operated by the Stanolind Oil & Gas Co. At Powell, the Seaboard Oil Co. recovered sulfur from natural gas.

The recovery of elemental sulfur in liquid purification of sour natural gas continued to dominate the nonmetal mineral industry of Park County. Sales of sulfur in 1956 dropped to 22,500 tons (a decrease of 26 percent from 1955), but production declined only 1 percent; the excess of output over shipments was stockpiled. The producing companies were Seaboard Oil Co. at Silvertip and Stanolind Oil & Gas Co. at Elk Basin. Construction-materials production consisted of 4,000 tons of commercial paving sand and gravel and 173,000 tons of Government-and-contractor paving sand and gravel, along with 2,800 tons of crushed granite, limestone, miscellaneous stone, and sandstone. All stone output was reported by contractors for highway construction. Agricultural gypsum was produced by the Wyoming-Gulf Sulphur Co. of Cody; output resulted from experiments to recover sulfur from native sulfur-gypsum ore. Ornamental stones—agate and petrified wood—valued at $660 were collected by Ted Ebert.

**Platte.**—Colorado Fuel & Iron Corp. continued to mine iron ore (hematite) from its Sunrise mine and to ship the ore directly to its plant at Pueblo, Colo., for production of steel. Output in 1956 was less than in 1955 because of a labor strike throughout July at the company steel mill.

The Guernsey Stone Co. quarried crushed limestone—the most important nonmetal in Platte County during 1956. Output was 361,000 tons, an 18-percent increase over 1955. The production was used mostly as railroad ballast and also as concrete aggregate and riprap. C. F. Lytle Co. quarried and crushed 6,800 tons of sandstone for riprap. Sand and gravel production consisted of 79,000 tons of paving gravel quarried by D. W. Hopkins, J. A. McPherson & Co., Inc., and Read Construction Co. as contractors for the Wyoming State Highway Department.

**Sheridan.**—Crude oil was produced from the Ash Creek and South Ash Creek fields and supplied two-thirds of the value of county mineral production.

Coal was produced at three mines—the Big Horn strip mine (Big Horn Coal Co.), the Welch strip mine (Welch Coal Co.), and the

Digitized by Google

Storm King underground mine (Storm King Coal Co.). The mines employed an average of 79 men during 1956.

Because of a shift in the location of highway-construction work, output of sand and gravel declined to 89,500 tons in 1956—a 42-percent drop from 1955. Big Horn Construction Co. and Alfred E. Matheson were contractors for the Wyoming State Highway Department, and Basil Dean, Mullinax Engineering Co., and Sheridan Sand & Gravel Co., Inc., furnished the commercial output. The shutdown of the Sheridan Wyoming Coal Co. scoria-mining operation reduced the tonnage of volcanic scoria (pumice) in Sheridan County during 1956 to 45,500 tons. The Tongue River Stone Co. was the only company actively producing scoria for railroad ballast and concrete aggregate. Clay production consisted of 1,600 tons of miscellaneous clay mined by the Sheridan Pressed Brick & Tile Co. and used in building brick and other structural-clay products at its Sheridan plant.

**Sublette.**—Oilfields yielding petroleum in 1956 were: La Barge, Tiptop, North La Barge, Big Piney, and Hogsback. The major source of natural gas was the Big Piney field. In August a 10-inch gasline was completed to connect the Big Piney field with the Pacific Northwest pipeline. Belco Petroleum Corp. did extensive development drilling in the field.

Carruth & Son, Inc., Rasmussen Bros., Studer Construction Co., and L. H. Weber, as contractors for the State highway department, produced 149,000 tons of paving sand and gravel, and L. H. Weber quarried 36 tons of crushed limestone. Both the stone and sand and gravel mined in 1956 were consumed in constructing highways.

**Sweetwater.**—Sweetwater County mineral products were principally petroleum, trona, coal, and natural gas. The county was the Nation's major source of trona and Wyoming's chief source of coal and natural gas. Construction materials, gem stones, uranium, and natural-gas liquids were also produced.

Sweetwater County petroleum output came from the Lost Soldier, Wertz, Church Buttes, and Hiawatha fields. Major gas-producing fields were the Baxter Basin, Canyon Creek, Church Buttes, Lost Soldier, and Hiawatha.

Exploration drilling during the year resulted in discovery of the Twin Rocks field (sec. 29, T. 21 N., R. 103 W.) by Carter Oil Co., the North Baxter Basin extension (sec. 23, T. 20 N., R. 104 W.) and the Chimney Rock field (sec. 12, T. 18 N., R. 102 W.) by Mountain Fuel Supply Co., and the Potter Mountain field (sec. 12, T. 14 N., R. 103 W.) by British-American Oil Producing Co.

In the fall, the Colorado Interstate Gas Co. completed a 22-inch branch-line connection from the Pacific Northwest pipeline to Denver, Colo. A natural-gas-liquids plant was operated at Baroil by Sinclair Oil & Gas Co.

Coal production declined sharply and totaled 0.9 million tons compared with 1.3 million in 1955. Cutbacks in production were recorded at mines operated by the Union Pacific Coal Co. and the Colony Coal Co. The Nugget No. 2 strip mine, 1 of the 2 mines operated by the latter company, was idle most of the year. The total average coal-mine employment for the county in 1956 was 563 men, compared with 655 men in the preceding year. Major producing

Digitized by Google

properties in 1956 were the Superior D. O. Clark and Stansbury mines of the Union Pacific Coal Co. and the Rainbow No. 3 mine of the Gunn-Quealy Coal Co.

Next to petroleum the mining of trona (natural sodium carbonate) and the subsequent reduction to soda ash constituted the most important single activity of the mineral industry of the county as well as the State. Shipments of soda ash and crude and calcined trona reached 338,000 tons valued at $8.3 million in 1956 compared with 319,000 tons valued at $7 million in 1955. Most of the 49,500 tons of sand and gravel production reported in 1956 was essentially commercial structural sand and gravel quarried by Layos & Layos, although some structural sand and paving gravel were produced for the Federal Bureau of Reclamation and the Wyoming State Highway Department by Sharrock & Pursel, Rasmussen Bros., and Don VanDeburg.

In addition, all of the crushed granite was classified as Government-and-contractor output and quarried by Sharrock & Pursel for the State highway department. No scoria (pumice) was mined in 1956 because of the shutdown of the Superior Pumice Co., Inc., operation near Superior. Gem or ornamental stones valued at $13,900 were collected and consisted of jade, agate, turritella, moss agate, petrified wood, and petrified and agatized algae.

Uranium ore was shipped from the Lucky Turk No. 15 claim by the Black Buttes Uranium Co. during the first 6 months of the year.

**Teton.**—The total value of mineral production in Teton County in 1956 was made up of 103,500 tons of sand and gravel quarried by Gibbons & Reed, Northwestern Engineering Co., Strong & Co., and Don VanDeburg, contractors for the Federal Bureau of Public Roads and the State highway department; and 10,100 tons of crushed limestone quarried by the Utah-Idaho Sugar Co. and used solely in refining sugar.

**Uinta.**—Natural gas from the Church Buttes field was the most valuable mineral commodity produced in Uinta County. The gas was piped in large part to Salt Lake City, Utah, through lines of the Mountain Fuel Supply Co. The same company also operated a natural-gasoline plant at Church Buttes.

Petroleum was produced from the Church Buttes and Spring Valley fields.

Sand and gravel production in Uinta County during 1956 resulted from highway contracts let by the Wyoming State Highway Department; F. R. Knowlton & Son and Don VanDeburg were the contract producers. Stone production consisted of 78 tons of dimension limestone quarried by F. R. Knowlton & Son for use as rough construction stone. In addition, 25 pounds of petrified wood was collected by E. Witka in the Carter area.

**Washakie.**—Mineral products of Washakie County in 1956 were petroleum, sulfur, natural gas and associated liquid products, and construction materials.

The major producing oilfields were the Cottonwood Creek, Worland, Slick Creek, and Murphy Dome. A sharp increase in production from the Cottonwood Creek field furnished the 79-percent increase in petroleum output for the county. In 1956 a major program of

Digitized by Google

development drilling was carried out in the Cottonwood Creek field by the Stanolind Oil & Gas Co.

The Worland field (Wyoming's leading producer of natural gas) and the Neiber Dome field were the major sources of natural gas in the county. At Worland, Pure Oil Co. operated a natural-gas-liquids plant and transmitted hydrogen sulfide gas to the Texas Gulf Sulphur Co. sulfur plant nearby.

Sulfur continued to rank second in terms of value of output in Washakie County during 1956, and shipments of elemental sulfur were 12 percent greater than in 1955. Although three plants were operated during 1956, only the Texas Gulf Sulphur Co. reported sales of finished product. Construction work at the Neiber Dome plant of Signal Oil & Gas Co. was completed during the year and, coupled with the Stockham Federal facility (built in 1955) of the same company, productive capacity of the industry increased considerably. A total of 9,300 long tons of elemental sulfur was recovered at both plants (Signal Oil & Gas Co.), but no shipments were made.

Other nonmetal production consisted of 18,500 tons of sand and gravel quarried by Niel Sorenson and Mullinax Engineering Co. for resale and Taggart Construction Co. for use under contracts with the State highway department and the Federal Bureau of Public Roads. Stone output resulted from contracts let by the State highway department to McClellan & MacQueen, Inc., and Taggart Construction Co. and by the Federal Bureau of Reclamation to D. M. Manning and Long Construction Co.; crushed limestone and crushed sandstone were the types of stone produced.

**Weston.**—The Clareton and Black Thunder areas of the Clareton Trend plus the West Mush Creek and Skull Creek fields were the major oil-producing fields of Weston County in 1956. Continued development drilling in the Clareton Trend placed Weston County second only to Natrona County in number of development wells successfully completed, although drilling activity was half that of 1955. County production dropped sharply during the year, mainly owing to curtailed output from the Clareton and Black Thunder areas; decreased output, however, was characteristic of all but a few of Weston County's 15 fields.

At Newcastle the Sioux Oil Co. refinery underwent modification to increase yields of the lighter petroleum fractions. In addition, the company constructed and placed in operation a natural-gasoline plant. The dry gas from the plant was used as fuel for the refinery. A second natural-gasoline plant was also operated at Newcastle by the Mountain Valley Corp.

Uranium ore was shipped during the first 6 months of the year from a school-section lease by C. L. Wicker.

Weston County ranked third as a producing area for bentonite. Three of the major producers in the State operated mines at Osage and Upton, and two grinding plants processed the crude ore at Clay Spur and Upton. The Baroid Division of National Lead Co., Wyodak Division of Federal Foundry Supply Co., and American Colloid Co. reported shipments totaling 185,500 tons valued at $3.1 million. Major uses for the ground product included rotary-drilling mud, bonding agent at foundries and steelworks, concrete admixture (sealing dams, etc.), and other applications.

Digitized by Google

Sand and gravel produced in 1956 consisted of 82,000 tons of pavi gravel produced by Mullinax Engineering Co. for resale and by B Horn Construction Co., Black Hills Constructors, Inc., Inland Co struction Co., and Knisely-Moore Co. as contractors for the Wyomi State Highway Department. Highway-construction contracts let b the State highway department resulted in the production of 2,000 to of crushed limestone by the Inland Construction Co.; the crushe stone was used as riprap on a road project.

Digitized by Google

Digitized by Google

Digitized by Google